THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXX. No. 741.] LONDON, JULY 24, 1877. [29th Year.] Price 6d.

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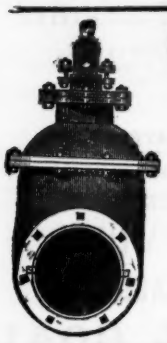

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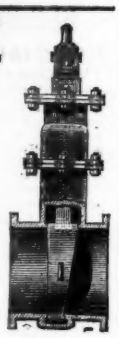

These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

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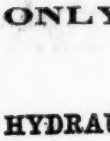

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The apparatus consists of a vertical pipe, the lower end of which is fixed to the main or collar, and the upper end to a box like a common syphon-box. Into this box is fastened a plate having a plug or valve thereon. The valve or barrel is fitted to a fixed seat or plug capable of turning upon it, and is square on the outside, and of such size as to fit a collar made to slip over it, the joint between the collar and the plug being made gas-tight by the former being forced down upon an india-rubber washer, by certain projections coming in contact with other projections formed in the interior of a cap or cover which surrounds the valve and collar before described. The top of the cover has a round hole with a notch or key-way on its opposite sides to admit of the projections or feathers on the collar passing through and on to the plug. To the collar is fixed the stand or service pipe, which is provided with an ordinary stopcock and gas-burner or pressure-gauge at its upper end. The action of the apparatus is simple. When it is desired to make the attachment, a service or stand pipe furnished with a collar, as described, is thrust down through the cap or cover, and, on being turned, will fix or jam itself tightly, so as to remain firmly upright, and at the same time turn on the gas from the main beneath. The action of removing the pipe effectually shuts off the gas, thereby ensuring great security against fraud, and loss by leakage.

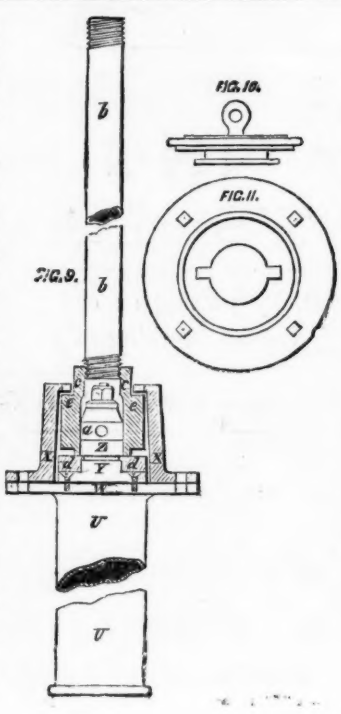

Fig. 9 represents the arrangement for the attachment of removable market or other gas stand-pipes. The view is a side elevation and part section. To the top of the service, U, is fixed a plate, W, and upon that is fastened by bolts the case or box, X. To the plate, W, is also fixed, by screws, the plug or valve, Y, and upon this plug the barrel Z is free to turn. That part of the barrel marked *a* is square. The stand-pipe, *b*, has attached to its lower end the collar, *c*, which is square in the interior, so as to slip over and turn the barrel by the square part, *a*, until the hole in the plug and that in the barrel coincide, when a gas-way will be established between the service, U, and the stand-pipe, *b*. A gas-tight joint between the collar, *c*, and the plate of the plug or valve, Y, is made by the former being forced down upon an india-rubber washer, *d*, by the upper part of the feathers, *e*, of the collar, *c*, coming in contact with inclined projections cast on the inner side of the box, X.

Fig. 10 is a plan of the top of the box or case containing the valve.

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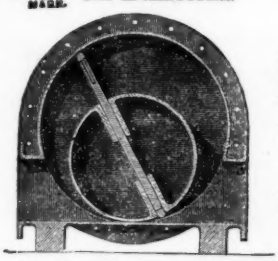

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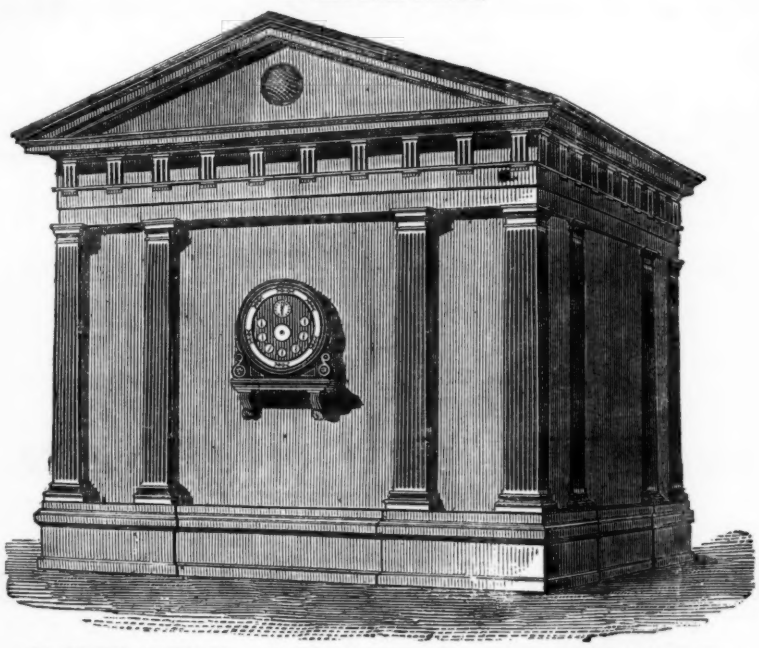

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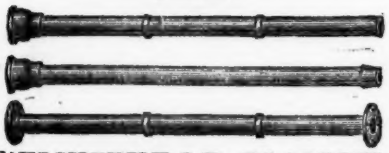
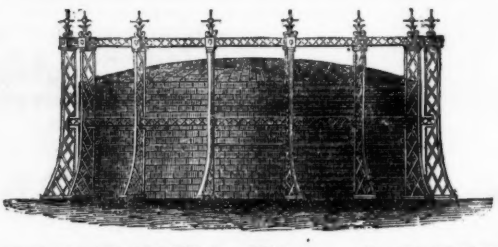
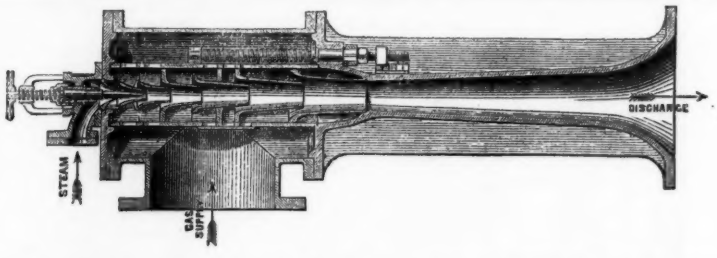
CAST-IRON GAS AND WATER PIPES.

DELIVERY F.O.B., GLASGOW.
Prices on application.

ALFRED WILLIAMS,
PHŒNIX FIRE-BRICK WHARF,
64, BANKSIDE, SOUTHWARK, LONDON, S.E.
ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS, AND FOR THE
SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,
AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

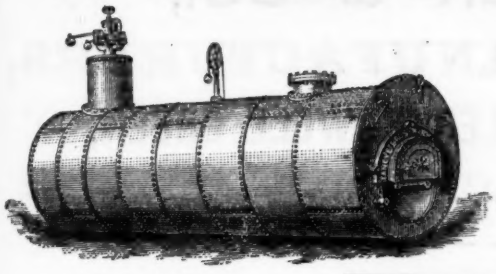
J. EDMUNDSON & CO.,
19, GREAT GEORGE STREET, WESTMINSTER,
LONDON, S.W.,
MANUFACTURERS OF EVERY DESCRIPTION OF
GAS APPARATUS.
CONTRACTORS FOR THE
ERECTION OF GAS-WORKS, GAS-FITTINGS, &c.,
FOR TOWNS, COUNTRY MANSIONS, &c.
Estimates given free of Charge.


THE HORSELEY COMPANY,
LIMITED,
TIPTON, STAFFORDSHIRE.
LONDON OFFICE:
6, WESTMINSTER CHAMBERS, VICTORIA STREET,
GAS ENGINEERS, IRONFOUNDERS, &c.,
MANUFACTURERS OF
GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,
AND ALL REQUISITES FOR EITHER
GAS OR WATER WORKS;
ALSO
MAKERS OF ROOFS, BRIDGES, &c.



KÖRTING'S STEAM-JET GAS-EXHAUSTER.
IMPROVED CLELAND'S PATENT.
UPWARDS OF 250 IN USE.
CLELAND'S PATENT CONDENSER AND STEAM SCRUBBER.
FOR PARTICULARS, APPLY TO
KÖRTING BROS.,
17, LANCASTER AVENUE, MANCHESTER,
OR TO
GERALD J. TUPP, 8, John Street, Adelphi, W.C.,
LONDON,
SOLE AGENT FOR ENGLAND AND WALES.

STEAM-BOILERS,



CORNISH,

LANCASHIRE,

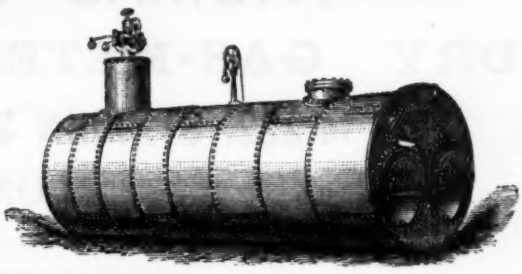
EGG-ENDED AND VERTICAL,

IN ALL SIZES,

AND OF

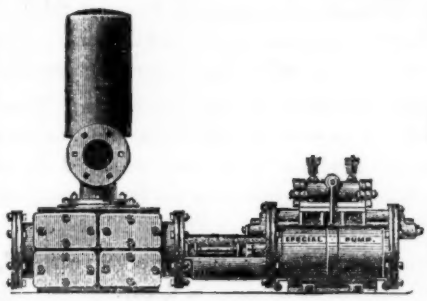
SUPERIOR QUALITY.

Prices on Application.



THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4*	2	9	815*	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65

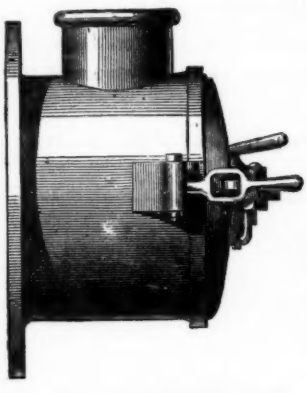


In use in 100 Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

200 Sizes made. Those in Table opposite are the leading Sizes for use in Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.



MORTON'S

Patent Self-Sealing

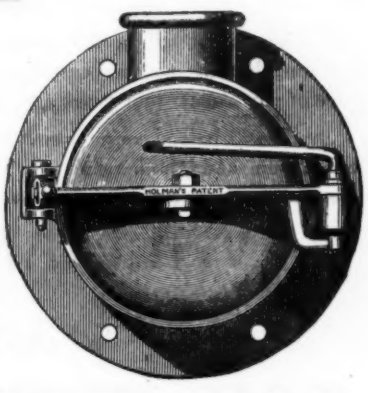
RETORT LIDS,

WITH

HOLMAN'S NEW PATENT BRACKETED CROSS-BARS, ANTI-FRICTION CATCHES, AND ECCENTRIC FASTENINGS.

Instantaneous Sealing effected. No Luting. No Duplicate Lids required. Holman's New Self-Sustaining Cross-Bar ensures freedom of joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), being now in use in nearly all the principal Gas-Works in London and the Provinces.



IMPORTANT TESTIMONIAL.

The Gaslight and Coke Company (commonly called the Chartered Gas Company), Beckton, North Woolwich.

Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them. I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly, (Signed) G. C. TREWBY.

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France) Devonport, Dronfield, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION TO

TANGYE BROTHERS & HOLMAN,

SOLE MANUFACTURERS,

LAURENCE POUNTNEY LANE, LONDON, E.C.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

TO GAS ENGINEERS AND MANAGERS.

It having come to our knowledge that a report is in circulation, spread by some unprincipled person or persons, that the cases of our larger-sized Meters are made of Galvanized Iron, we think it only fair to ourselves, and just to our customers, to say, that we never have used, in making any of our Meters, a single pound of *Galvanized Iron*, or any other *cheap* and *inferior material*, and this can be easily seen by opening any of them.

The cases of our large-sized Meters, from 20 lights and upwards, are all made of the very *Best Best Patent Alloy*, which is nearly double the price, and will last more than double the time, of some other material that has been and still is very largely used for the same purpose. And our experience, acquired by an extensive use of it for upwards of 30 years, enables us to say with confidence that no other metal in use for the purpose is so little liable to corrosion from the action of the gas.

We have now in use a Meter made in 1848, and therefore 29 years old, the case of which is made of Patent Alloy; the Meter is still in perfect order, and shows no signs of decay.

The utmost care is exercised by us in selecting none but the very best materials for all parts of our Meters; much of it is made *expressly for us*, as it is not possible to obtain it in the open market of the same superior quality.

The great fall in the price of all materials used in making our Meters has enabled us to give an increased discount, thus giving our customers the benefit of the fall. This we were bound in fairness to do, as we raised the price of our Meters four years ago, when the price of all metals went up.

It will be our constant endeavour, by using none but the best materials, and employing the most skilful workmen, to maintain the high character our Meter has hitherto borne.

WILLIAM PARKINSON & CO.

(ESTABLISHED 1816)

ARE THE ONLY MAKERS

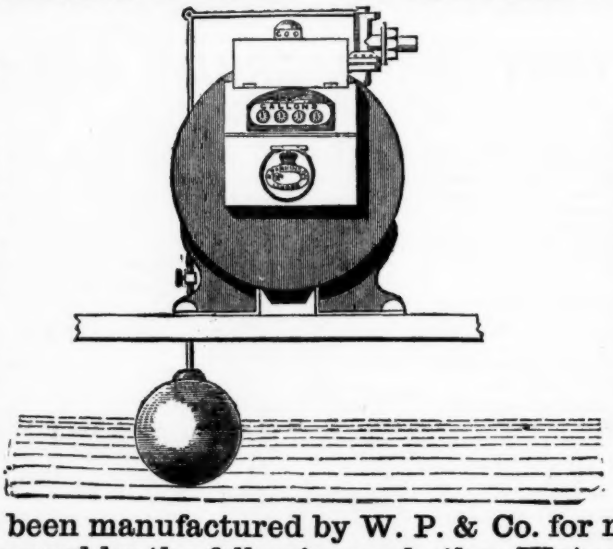
OF THE

LOW-PRESSURE WATER-METER.

These Meters will register with perfect accuracy, either at full speed, or with a few drops only passing through them.

They must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below. Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



From "The Engineer," April 6, 1877.

"Low-pressure Meters have been found to register with almost perfect accuracy, or, at all events, within 5 per cent. either for or against the consumer, and from the nature of their construction are by no means easily deranged. Still, even the low-pressure meters have their disadvantages, but these are chiefly as respects the question of first cost, seeing that they must have a cistern fixed at a higher level than that at which the supply is needed. All things considered, however, the balance of opinion rules at present in favour of the low-pressure Meter, and they are consequently increasing in favour as time goes on."

These Meters have been manufactured by W. P. & Co. for more than 25 years, and are largely used by the following and other Water Companies:—

NOTTINGHAM, DERBY, LEICESTER, SUNDERLAND, GREAT YARMOUTH, SHEFFIELD, NORWICH, LOWESTOFT, COVENTRY, SOUTHEND.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

J. H. *writes:* "*We have several hundred tons of gas lime on hand, for which we cannot find a market. Is there any way of utilizing it for other purposes except that of agriculture?*" [*Well fouled lime—i.e., sulphuretted lime, when weathered, consists to a great extent of sulphate of lime, and when heated becomes plaster of Paris, or Parian cement, and may be used as a cement.*—ED. J. G. L.]

Q. E. *says:* "*I am told by several gas and other gentlemen that they apply dilute ammoniacal liquor, with very beneficial effect, to vegetables, &c., in gardens. Will any of your correspondents give me the proper proportions, and the best method of applying the same, as I have often been asked for such information; also the kind of vegetables?*" [*Ammoniacal liquor is an exceedingly useful fertilizing agent, but it must be applied to the ground in a very dilute state.*—ED. J. G. L.]

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 24, 1877.

Circular to Gas Companies.

ALTHOUGH it cannot be said that gas shares have returned to the value they bore not long ago, it may be safely affirmed that public confidence in the substantial and permanent worth of gas property is completely re-established. So far the speculators who operated for a great "fall" have been disappointed; but, no doubt, renewed attempts will be made to bring down prices. As experiments with electricity are repeated, and sensational reports appear in the newspapers, we may expect mitigated revivals of the recent scare. The best preventative of mischief is, of course, the diffusion of accurate information as to the relative merits of the rival lights. And on this point we must say that we, and all gas shareholders, are greatly indebted to Mr. Backler, the very able Director of the European Gas Company, for the remarks which we publish to-day. He has taken pains to inquire into the matter, and he has come back from the Continent with the conviction that the "electric candle," at present, is a delusion. He guards himself carefully, however, as we have always done, from expressing a confident opinion as to its future. On one point he and we are both confident. The "electric "candle" can never be a domestic institution. The present defects, indeed, so clearly stated by Mr. Backler, render it inapplicable for any practically useful purpose, other than that for which the Holmes and Siemens light is employed. It is, in fact, little more than a scientific curiosity, and will long remain nothing else. We need not, however, close our eyes to the possibility of further developments. Science is not stationary; but until an entirely novel source of electricity is discovered, gas will find no competitor in that force; nor even then unless means of modifying and controlling that force are found, which are to-day beyond even the reach of speculation. Thus gas will continue, for generations, to hold its ascendancy as an illuminating agent. Its other uses, as was remarked by Mr. Livesey at the European meeting, require to be further developed, and if the recent "scare" produces the consequences that gentleman desires to see, we agree with him in the belief that it will have been beneficial. It rests with Gas Companies to make themselves popular as well as prosperous, and just as they do so their prosperity will increase. Gas is an article of ever-growing necessity. Extensive as is its employment, and enormous as is its manufacture, the consumption extends year by year, and is still susceptible of infinite extension. Under these circumstances, the duty of Gas Companies is clear, and their interest manifest. They have only to make the best and purest article they can from the material they have at command, and to teach an, unfortunately, ill-instructed people how to use it to the best advantage.

We must leave the evidence in the case of an alleged nuisance at the Exeter Gas-Works to the judgment of our readers, with a very few remarks. It may be assumed that the Magistrates did not take a serious view of the case, although they inflicted a fine of five pounds on the Company. That some stench did arise from the works in the early part of the year can, we think, be hardly disputed; but it apparently arose from an accidental cause, which, we must believe, was quickly remedied. Raw gas, it would appear, escaped in considerable quantity; but, as we have remarked before, the loss to the Company from this source, if it had continued, would have been so great, that every effort must have been made to prevent such a cause of annoyance in the neighbourhood of the works. As regards the condition of the plant, we must leave our readers to form their own opinion from the evidence reported. On some points the expert witnesses agree; on others they hopelessly differ. Be the actual circumstances what they may, however, it seems that the Company are doing their utmost to avoid nuisance in future. The worst of it is that when works, not perhaps originally well planned, have been allowed to fall into a state of dilapidation, it takes a good deal of time and money to get them into good working order. The Exeter Company are finding this out now to their cost. But it will soon be over. They have a clear course. It would seem that they are in no danger of being bought up, so they have only to set their house in order, and everything will go on pleasantly.

While speaking of alleged nuisances from gas-works, we may mention a case recently reported at New York. There is in that city, it seems, a Children's Hospital in close proximity to the Market Street Gas-Works, and complaint was made that foul emanations from the works injured the health of the children. The proceedings must have been going on some time, for we find that two Commissions have sat and reported on the case. The last report, that complaints of bad odours from gas-works arise from two causes—one special and preventable; the other, to a great extent, unavoidable. The first is "fouled" purifying material, chiefly lime; and the other is due to steam, smoke, and some other inevitable consequences of the manufacture of gas on a large scale. It was to the former which the chemists on the Commission directed their attention, and they suggested what they call a new mode of purification, but which many of our readers will recognize as of long standing—viz., the use of sawdust saturated with sulphuric acid—known here as M'Dougal's compound—before the gas reaches the lime. By this process it is said that all causes of complaint are removed, and the lime purifies a much larger quantity of gas. It comes from the purifiers in a comparatively inodorous state, and causes no offence when shovelled into barrows. There can be no doubt that the complete abstraction of ammonia and some other volatile compounds before the gas reaches the lime will tend to reduce the stench of the fouled material, and, therefore, this process, which the American Commissioners describe as "essentially new," but which we regard as decidedly old, may be worth adopting when neighbours are squeamish in their tastes. If the Exeter Gas Company were not so far advanced with their improvements, the process might have satisfied their necessities.

The accounts of the Metropolitan Gas Companies annually returned to Parliament have been issued, and we shall as soon as possible give our abstract in the usual form, and then comment on the chief features presented.

We are sorry to see that the dispute between the Corporation of Maidenhead and the Gas Company is not yet satisfactorily

arranged. The Company seem to have made some concessions, of what nature we are not exactly informed, and at the last meeting of the Council the Mayor announced that all difference was at an end. It had apparently been resolved to light the town on the average meter system; but some Councillors objected to the expense of meters, and it was decided to re-open negotiations with the Company by making an offer of £3 10s. per lamp, and, if this were declined, it was again proposed to light the town with oil. We should have no objection to see the oil illumination tried, for we are confident what the result would be; the Gas Company would soon get their own terms. But the adoption of the meter system offers the true solution of the difficulty. The expense of meters is not so great as some members of the Council seem to suppose; and, in short, the recommendations of the system are so numerous that we are astonished that any intelligent body of men should refuse to adopt it.

The address of Mr. A. Macpherson, President of the North British Association of Gas Managers, calls for but few remarks. In the course of it he alludes to an opinion repeatedly expressed in these columns, that it would be well if the use of very rich gas were discontinued in Scotland, and a near approach made to the quality commonly employed here in the South. We willingly admit the cogency of some of the arguments made use of by Mr. Macpherson. It is, in one sense, desirable to have everything in as concentrated a form as possible. Rich gas, as he puts it, requires proportionately a smaller plant and smaller distributing apparatus, and in that respect is economical. But universal experience has shown that concentrated preparations are always wastefully used, and this is true of gas as of everything else. According to our observation (limited, we must admit), not a little of the richer gas in Scotland is wasted in blackening ceilings. By all means, let the Gas Companies and Corporations provide their customers with burners appropriate for the consumption of rich gas; but, even then, the admitted difficulty remains, that high-class cannels are disappearing from the market, and the time cannot long be deferred when recourse must be had to lower qualities, producing gas of lower illuminating power. By lowering the standard, the life, so to say, of rich cannel will be prolonged. The day may be very distant when Dundee will be lighted with twelve-candle gas; but that city might have twenty-candle gas for many more years than they will get thirty.

We are not altogether surprised that the Burghs (Scotland) Gas Supply Act has not been more extensively adopted. Even in Scotland an opinion obtains among Local Authorities that the supply of gas should be a source of profit for the relief of rates; and the terms of the Act are opposed to this principle. It insists on the application of what we call the co-operative system, and there are many Scottish authorities who object to the plan. Just now, for example, the Police Commissioners of Greenock are rejoicing over having a profit which enables them to apply £4000, as they say, in relief of taxes. It is a miserable delusion. They have plundered the gas consumers to that extent, but they have not removed a shilling of taxation, and, what is more, having made very favourable contracts for coal during the present year, they take nothing off the price of gas.

Mr. Macpherson is not frightened by the "electric candle." He sees, as we do, that gas will last our time and a long while after us. Our object, as said elsewhere, must be to make the most of gas now, and all the means are at hand.

It would appear that the two Brighton Gas Companies are threatened with an attempt on the part of the Corporation to buy them up—one at a disadvantage. Opposing works are, as a matter of course, talked of; but this is a mere *brutum fulmen*. The Black Rock Company are just now engaged in an expensive litigation, with reference to the explosion at the corner of Market Street; and, in connexion with this, it is proposed to put the screw on the Company, to compel them to sell their undertaking. It has yet to be decided who is responsible for the damage caused by the explosion, the Gas Company or the Corporation, and it will be time to speculate on the results when that point is settled. The purchase of the water undertaking has not proved a successful speculation, and we have no doubt the Corporation would be glad to get hold of the gas-works. The latter undertakings are, however, two of the soundest in the kingdom, and they can only be parted with at the fullest prices. We shall, no doubt, hear more of this matter soon, and may reserve further comment.

An agreement appears to have been come to, between the Stoke Gas Company and the Corporation of Stoke, for the sale of the gas-works in that town for the sum of £85,000. This would seem to represent twenty-five years purchase of 10 per cent. dividends on the capital said to be employed—£34,000—or fourteen and a half years purchase of the annual profits which the Company have made for the last seven years. This will be an extraordinary bargain for the Corporation. Next week we shall publish the report of the Committee, in reference to the purchase, and call attention to the reasons brought forward by them in support of their recommendation.

Water and Sanitary Notes.

The Twelfth of August is rapidly approaching, and the annual Massacre of the Innocents has commenced. Among the first of the Bills which disappear from the paper of the House of Commons must be mentioned that ill-starred measure, the Public Health (Metropolis) Bill. It was quite obvious, from the first, that the opposition raised against this Bill was sufficiently strong to prevent its being passed this session, and the Government are to blame for introducing it so late, and in such a stealthy manner. It is quite possible, although not probable, that if a longer time had been given for a consideration of its provisions, suggestions might have been made for the removal of what is considered objectionable; and, as a purely Consolidation Act, it would have constituted a valuable addition to the Statute Book. No time, however, remained for a full and dispassionate consideration. The Vestries and District Boards took alarm, and raised an outcry against "centraliza-"tion," and the result is apparent. We have pointed out that all, or most of, the provisions of the Bill withdrawn are law all over the country beyond the metropolitan area; and we fail to see why Hodge should be legislated for differently from, say, Smith, the Cockney. If Hodge, as a member of some Local Authority, requires looking after, Smith no less requires supervision. If the Local Government Board have any *raison d'être* at all, their functions must be extended all over the country. They were originally called into existence, we rather think, to make places for a few enterprising gentlemen like Mr. Edwin Chadwick, C.B. The scope of the Board's operations has, however, in recent times, been enormously extended, and it requires more looking after. The permanent officials of the department are, no doubt, ambitious to still further extend their power, to make more places, to acquire more patronage, and next year we shall see another attempt made to get the Metropolis under their thumb; and they will have them there, unless we are greatly mistaken.

We are sorry to see that the Metropolitan Board of Works have determined on abandoning one of the most important public improvements they have ever projected—the formation of a wide street from Tottenham Court Road to Trafalgar Square. A part of this line runs through property which belongs to the Marquis of Salisbury, and he succeeded in persuading a Select Committee of his Peers to impose conditions which the Metropolitan Board consider are opposed to their interests. The noble Marquis evidently tried to do a smart stroke of business, but we are by no means certain that the Board are right in abandoning the scheme. They, too, want to make profits out of improvements, and one consequence is that London is dotted with vacant places, for which more money is asked than people are willing to pay, and which, while they remain vacant, cause a serious loss to the rates.

"About a score" of people, we are told, assembled at the Town-Hall, Manchester, on Thursday morning last, most of them being members of the Corporation, on the occasion of a meeting, called, under the Borough Funds Act, to approve the promotion of a Bill to carry out the Thirlmere water scheme, to which we referred last week. The scheme, if carried out, will cost the Manchester ratepayers about one million and a half. Doubtless, the inhabitants of Manchester have full confidence in their Corporation, and Sir Joseph Heron will probably quote the fact we mention as a proof that the Borough Funds Act is quite unnecessary, and ought to be repealed. The ratepayers of Liverpool are, however, of a different opinion. A similar question raised there would have attracted crowds to the Town-Hall.

In reply to Colonel North, yesterday week, Mr. Sclater-Booth said that his attention had been called to Dr. Frankland's reports on the condition of the water supplied by the Southwark and Vauxhall Company, and that he had requested Major Bolton to make a special inquiry into the condition of the Company's filtering-beds. We could have wished that a wider inquiry had been directed by persons competent to express a sound opinion. It has never been proved that "living and "moving organisms," of the kind continually reported by Dr. Frankland as present in the Thames waters, have ever done the smallest injury to any human being, and the sensational paragraphs from time to time inserted in his reports are calculated needlessly to alarm the public.

ON THE PURIFICATION OF COAL GAS.

By Dr. H. BUNTE.

[Translated from the *Journal für Gasbeleuchtung.*]

(*Concluded from Vol.* xxix., *page* 828.)

In the foregoing remarks special emphasis has been laid on the ammonia liquor, as produced in gas manufacture, not being applicable with advantage to the complete purification of the gas on account of its weakness—*i.e.*, its small content of ammonia.

It is, therefore, necessary to form a concentrated liquor, caustic ammonia, from the raw liquor, for the purifying process. The production of this fluid does not require any special apparatus, but is carried on everywhere, or may be carried on, where the gas liquor is properly treated for ammonic salts by the process of Mallet or Solvay.

In gas-works where the production of ammonic salts is carried on, the introduction of the purifying process offers no difficulties. The strong ammonia water is gained by distilling off a larger quantity of the gas liquor, and condensing the vapour in other gas liquor till it has attained the required strength. The cost of the fuel, &c., will be saved later on in working up the spent liquor for ammonic salts.

Continued wetting of the scrubbers with the same ammonia water will also produce the required concentration. The liquor from the hydraulic and the condenser must, of course, be kept separate from the portion intended for purifying.

When the ammonia water is brought to the required strength, it is freed from the greater portion of the sulphuretted hydrogen and carbonic acid by the somewhat modified process known as Hills's process, and then again pumped over the scrubbers. When it has recovered from the gas the volumes of SH_2 and CO_2 removed in the regenerator, it is again submitted to this latter process.

The portion of ammonia water employed can, therefore, in theory, purify an unlimited quantity of gas from sulphuretted hydrogen and carbonic acid. The process by which this is effected may justly be called regeneration.

The action of the ammonic salts, discussed earlier on, especially that of the only two at present in question, $(NH_4)_2CO_3$ and $(NH_4)_2S$, offer a ready means of removing the greater part of the carbonic acid from a solution containing these two salts, and generating free caustic ammonia.

If a solution of ammonic carbonate is heated above 60° C., the salt contained in the solution is decomposed. The constituent elements, however, remain, for the most part, dissolved in the water, as the limit of saturation for ammonia, at the concentration assumed, is not reached (according to Sims's tables), and the capability of absorbing carbonic acid is increased by the presence of the ammonia.

By increasing the heat, the tension of the gases, CO_2 and NH_3, retained in the liquid by physical attraction, is increased, and at last becomes so great that the gases escape in bubbles, the carbonic acid first, and afterwards the ammonia, the latter being more strongly held by the water.

This action may be easily demonstrated by the following experiment:—Into a nearly saturated solution of ammonic carbonate a piece of the solid salt is introduced; a violent evolution of gas immediately commences, the escaping gas being chiefly carbonic acid; the remaining solution must, therefore, contain less carbonic acid in proportion to the ammonia than the solid salt.

This proceeding also shows clearly the decomposing power of water, for the solid salt evolves no carbonic acid (or only a very small quantity with ammonia) at the same temperature at which, in water, it yields streams of CO_2. It also demonstrates the prejudicial influence of too much weakening on the formation of acid salt, and explains why acid salt is only formed in those parts of the works and the pipes where there is but little water.

The formation of free ammonia in a solution of ammonic carbonate is even more clearly exhibited, if the solution is heated to boiling for a few minutes. The liquid, after this operation, contains besides undecomposed carbonate, free ammonia. To prove this, it must be supersaturated with an excess of chloride of barium. The ammonic carbonate forms with it ammonic chloride and carbonate of baryta. The strong reaction of the liquid over the ($BaCO_3$) precipitate can only be caused by free ammonia, as the other salts dissolved in the liquid, NH_4Cl, $BaCl_2$, do not react on each other.

Quite analogous to the above simple experiment is the regeneration of the ammonia water, which consists principally of a solution of ammonic carbonate, or may easily be converted into it.

The salts of the gas liquor concerned in the purification and regeneration are ammonic carbonate and hydrosulphuret of ammonia.

To remove the sulphuretted hydrogen contained in the gas liquor, the concentrated ammonia water intended to be regenerated is passed over oxide of iron. To effect this, arrangements similar to those for lixiviation as followed in soda works are suitable. The sulphur withdrawn (about 8 kilogrammes per cubic mètre of the gas liquor B) can be easily recovered.

(1.) By this operation the sulphur contained in the gas liquor, which has hitherto been wasted, may be utilized.

(2.) The ammonia, hitherto combined with the SH_2, is recovered free and available for further use in purifying.

The gas liquor, consisting now chiefly of ammonic carbonate, is heated. The apparatus constructed by Hills and Solvay would, with some slight modifications, which practice would soon indicate, be quite suitable; the principles on which they are constructed have proved themselves rational.

When the sulphuretted hydrogen is removed, the process becomes much simpler, and the regeneration more complete.

If only carbonic acid and sulphuretted hydrogen were absorbed from the gas, the purifying liquid could be used for a long time, especially as any loss of ammonia during regeneration, if the ammonia liquor be of the proper strength, is replaced automatically from the ammonia-containing gas that enters the scrubber. But besides the reactions considered, others take place, by which a portion of the ammonia is lost for purification.

One of these reactions is occasioned by the presence of sulphide of carbon in the gas, with ammonia or sulphide of ammonium. This body converts a portion of the ammonia into sulphocyanide of ammonium, giving off sulphuretted hydrogen*:—

$$CS_2 + (NH_4)_2S = CS\begin{matrix}SNH_4\\SNH_4\end{matrix}$$

$$CS\begin{matrix}SNH_4\\SNH_4\end{matrix} = (CSN)NH_4 + 2SH_2$$

The sulphocyanide of ammonium thus formed is lost for any further purification of the gas, as it cannot be regenerated. Still, these and similar decompositions can only be regarded as minor reactions, which do not affect the utility of the method in any way.

The cost of this process can only be approximately estimated without practical experiments. The dimensions of the apparatus and gasholders employed, and the expenditure of motive power per 1000 cubic mètres of gas, may be calculated by a practical man, according to the circumstances of each case, from the figures given above. As in the above process, the regeneration of the ammonia liquor takes the place of the cost of fresh purifying material, a comparison of the cost of these two items will lead to a tolerably accurate conclusion.

According to the communications of Hanrez (*Journal für Gasbeleuchtung*, 1877, p. 4) on the use of Solvay's boiler for preparing the gas liquor, the expenditure of fuel for 1 cubic mètre is 36 kilogrammes of coal. As the regeneration does not require the complete removal of the ammonia and distilling over a portion of the liquid, but only the heating of the liquor to be regenerated to about 90°, the above estimate may be considered ample.

As, for 1000 cubic mètres of gas, 1 cubic mètre of ammonia liquor of the strength A must be regenerated, an expenditure of 36 kilogrammes of coal should procure purifying material for 1000 cubic mètres of gas. But as I have no other working results before me I cannot speak as to the correctness of these figures.

The whole method, as above described, and in part explained, is intended to introduce one single wet purification instead of the present separate wet purification in the scrubber, and dry one in the oxide of iron purifiers. The importance of this step—the doing away with a great part of the dry purification—becomes obvious when it is remembered that the dry purifiers are the most critical of the whole apparatus, and by means of the wet purification a continuity is attained quite impossible with iron oxide.

If the advisability of converting dry into wet purification is admitted, the immediate practical result will be an extension of the scrubber system, and the supersession of the dry process by washing with the strongest possible ammonia water.

As to the other apparatus used, the principal requirement is to separate the tar as completely as possible from the gas before passing the latter through the scrubber, for without this a uniform wetting and thorough utilization of the ammonia water cannot be effected. Apparatus lately devised for distributing the ammonia water and thoroughly wetting the scrubbers will assist in carrying out practically the wet process.

The general conclusions enunciated above with respect to the purification of coal gas generally, and the removal of carbonic acid in particular, are based on special researches carried out at the gas-works at Munich, and on the experience of others as made known in print.

I am quite conscious that these researches are by no means complete, and in many points require to be confirmed by further experiments, which I hope before long to be able to undertake. Meanwhile the results ascertained may be summed up in the following conclusions:—

(1.) The gas liquor obtained in the distillation of coal is too weak to be applied with advantage to purification.

(2.) To purify the gas, the ammonia liquor should be as strong as possible, which may be attained by methods already known.

(3.) Hills's process is based on rational grounds, and if the solution to be regenerated is sufficiently concentrated, will render the application of the wet process of purification possible.

(4.) The regeneration of strong ammonia liquor can only be profitably effected after decomposition of the sulphuretted hydrogen and elimination of the sulphur by oxide of iron.

(5.) The gas liquor collected in the hydraulic and the condenser in making the gas must be kept quite separate from that destined for purification.

PRESTON GAS COMPANY.—The half-yearly meeting was held on the 16th inst.—Mr. Booth in the chair. A dividend at the rate of 10 per cent. on the A stock, and of 7 per cent. on the B stock, was declared.

SALE OF PROVINCIAL GAS AND WATER SHARES.—On the 14th inst., at a sale by auction, two old £20 shares in the Colchester Gas Company realized £36 each; two new shares in the same company, £26 10s. each; and two others, £25 10s. each; five £5 shares in the Wivenhoe Gas Company were sold for £5 each; five £3 shares in the Brightlingsea Gas Company for £4 each, and five £1 shares in the Brightlingsea Water Company for £2 each.

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* To this reaction the greater quantity of SH_2 contained behind the scrubber than before it may partly be ascribed.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

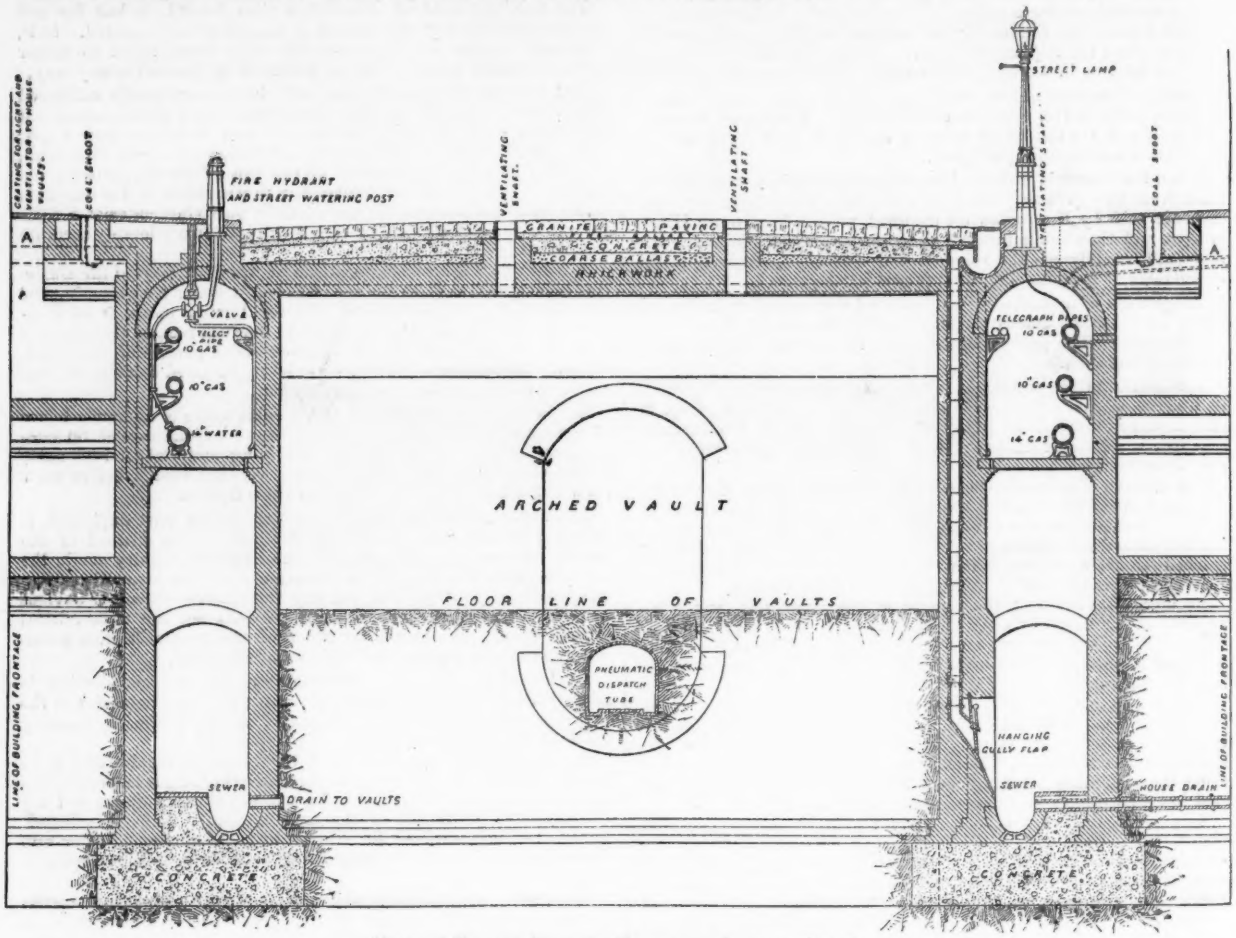
CXXXIX.

Subways (*continued*).

The subways constructed in the Holborn Viaduct, and in the new streets connected therewith, were designed by Lieut.-Col. W. Haywood, C.E., the engineer and surveyor to the Commissioners of Sewers of the City of London, and were carried out under his immediate supervision. These subways are the most complete in their general arrangement, and in the means adopted for ventilation and lighting, of any similar structures in existence.

Prior to their construction, some experience, as we have seen, had been gained in the Metropolis in the formation and employment of subways for the purposes intended, and the subject had, on repeated occasions, undergone exhaustive scrutiny by committees of both Houses of Parliament, counsel and witnesses of the highest eminence being retained for and against the project. The valuable opinions and suggestions elicited in these several inquiries, and contained in the mass of evidence thus presented, combined with his own extensive engineering experience, enabled Lieut.-Col. Haywood to produce structures that, for excellence of design, may well serve as examples of what a subway ought to be.

By the courtesy of Lieut.-Col. Haywood, we are enabled to give the accompanying drawings, together with a detailed description of these structures as they exist in the Holborn Viaduct and the new streets adjoining.



Holborn Viaduct Subways—Transverse Section.—Fig. 5.

The transverse section (fig. 5) of the Holborn Viaduct subway is taken at a point across the Viaduct, near to Farringdon Street, where the space between the sewer and the flooring of the subway is much greater than it is on both the east and the west of that point, because the sewer runs up the hill at a considerable inclination, whereas the floor of the subway is nearly level.

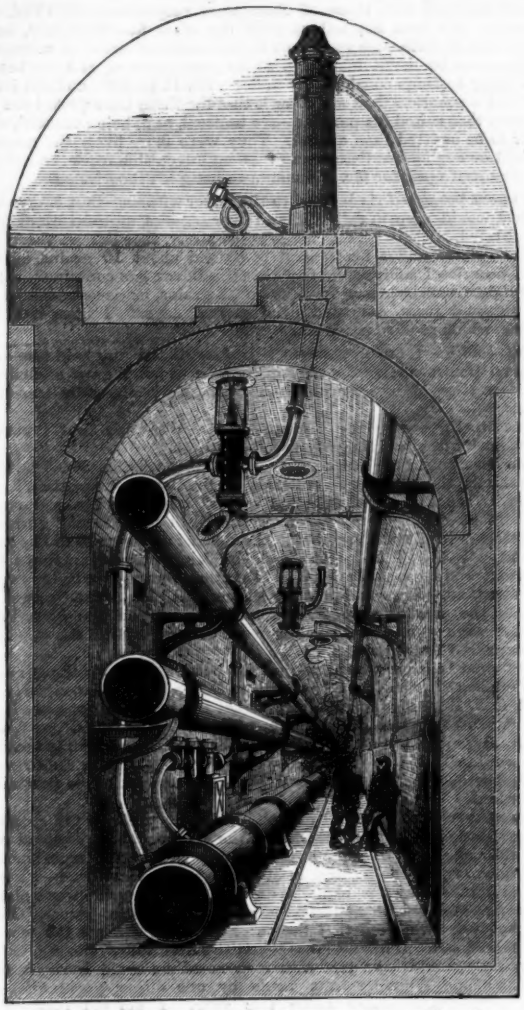
Beneath the footways on each side of the Viaduct, and between the large central vaults and the vaults of the houses on the outer sides, are the subways, their dimensions for the most part being 7 feet wide and 11 feet 6 inches high to their soffits or coverings, which are formed of semi-circular brick arches. The lining of the subways is of white Burnham bricks; the floor of Yorkshire stone landings, built into the walls on each side, and laid with an inclination corresponding with the road surface above. On the sides next to the central vaults, channels are cut in the landings, and at intervals of 24 feet, openings, covered with bell-traps, communicate with the sewers beneath.

Immediately above these trapped openings to the sewers are iron pipes, connected with the drain-pipes in the spandrels of the central vaults, which convey any water that may leak through from the street surface into the sewer; by means also of these trapped openings, the surface water which falls into the subways through the ventilators in the footways, and the water used in washing the subways, escapes into the sewers.

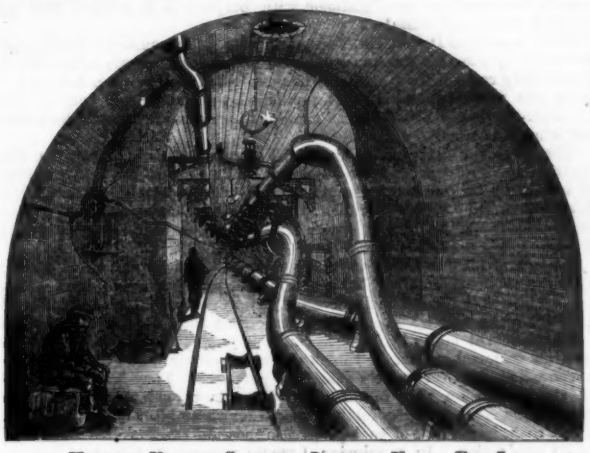
Owing to the difference between the old and new levels, and to the three bridges upon the line of the Viaduct, the subways necessarily vary in design at about every 80 feet of their length. They are carried over the London, Chatham, and Dover Railway by an iron construction, being at that spot 7 feet 6 inches high and 12 feet wide; on both sides of the Farringdon Street bridge they are connected with the Farringdon Street level by vertical shafts which terminate close to their entrances in Farringdon Street. At Shoe Lane they descend by shafts, and are carried beneath that street, where they are 8 feet high and 7 feet wide, formed with brick sides, stone bottoms, and iron coverings.

The entrances to the subways at Farringdon Street are by large iron gates, 8 feet wide, and varying from 12 feet 6 inches to 15 feet 9 inches in height; in their rear are wooden doors, which can be closed, should it be found expedient, in times of severe frost, to reduce the current of air through them. There are also entrances, closed by iron doors with open gratings over them, in Shoe Lane; and at the eastern and western ends of the Viaduct there are openings, similar in character to those ordinarily used over the entrances to the sewers, but larger, beneath which are flights of steps for the entry of workmen. Means are also provided by which pipes of large size can be lowered into or taken out of the subways, immediately adjacent to these entrances.

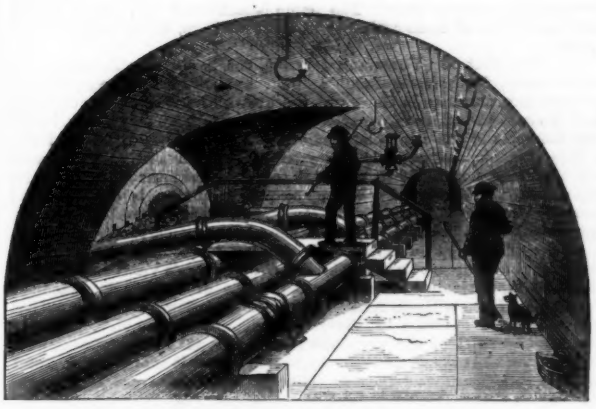
The ventilation of subways in which gas-mains are laid is of the utmost importance, for on the efficiency of the arrangement in this respect depends their success or failure. Lieut.-Col. Haywood has provided for this by means, firstly, of shafts, rising from the crown of the arches, terminating by open gratings, 12 inches in diameter, let into the footings; secondly, by circular shafts or flues, 8 inches in diameter, which start from the crowns of the arches, pass over the house vaults, and are carried up in the party walls of the houses, where they terminate at the roof; thirdly, by openings in the crown of the arches, connecting with the lamp-posts on the public way, the lower part of each post being perforated to afford ventilation. Half way up the post a disc or diaphragm is fixed, to prevent any mixture of air and gas that may have collected from reaching the flame. There are also air bricks built into the walls between the subways and the house vaults, and openings in the gates at Farringdon Street and Shoe Lane, as above described; by these means a circulation of air is always maintained in them, and up to the present time the ventilation has been found sufficient.



HOLBORN VIADUCT SUBWAYS—INTERIOR VIEW.—FIG. 6.



HOLBORN VIADUCT SUBWAYS—INTERIOR VIEW.—FIG. 7.



HOLBORN VIADUCT SUBWAYS—INTERIOR VIEW.—FIG. 8.

That portion of the subway on the southern side of the Viaduct, which is between Farringdon Street and Shoe Lane, is lighted by gratings filled in with glass lenses, placed at intervals of 40 feet, which render it sufficiently light by day for the purposes of inspection and work. The others have no daylight excepting that obtained through the ventilating gratings in the footways; but provision for artificial lighting is made throughout the whole lines of subways by burners. These are suspended from the crowns of the arches, and connected with the gas-mains in the subways, as will be hereafter more fully described.

To afford a supply of gas and water to the houses, square iron tubes are built into the walls, between the subways and the house vaults, through which the service-pipes, after being connected with the mains, are passed.

Eastward of Snow Hill, beneath that portion of the new roadway which has been raised up by filling in with ground, the subways are carried to the Old Bailey and Giltspur Street, of the same dimensions as those beneath the Viaduct, but from the western end of the Viaduct to Hatton Garden they are 12 feet wide, and 7 feet 6 inches high, with a semi-circular crown, and resemble those in the side streets.

(To be continued.)

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

SULPHUR PURIFICATION.

SIR,—If Mr. Versmann knows so much more of this subject than any one else, as his letter to you would imply, it seems strange that, though he was present in the committee-room during the whole inquiry, presumably on behalf of the company, he was not called by their counsel. Had he, in his letter to you, confined himself to facts, such expressions as "airing their little wisdom" and "degrading and prostituting science," applied to other (I should be sorry to say brother) scientific men, might well have been passed in silence. As, however, it is hardly to be expected that all your readers will wade through the whole of the evidence and judge for themselves, I must ask you to permit me to correct him on one or two points, which would otherwise lead to misconception.

I would remark, in passing, that I fail to see what bearing the doings in Germany have on the case. Prussian subjects submit to many things to which Britons would object, and it is not because Berliners swallow a certain amount of sulphur that the citizens of London should be obliged to do the same.

I pass over Mr. Versmann's strictures on the structure of the committee, which are a sneer at the wisdom of Parliament, with the remark that, though, like most juries, it was not composed of experts, it was quite as fair to one side as the other. When, however, he tells us that its conclusions "are based on mere assertions stated as positive facts," and that the chemical evidence adduced against the companies was "distinctly put aside" by the opposing counsel, it is necessary to point to the facts.

The sulphur question proper was decided on the Crystal Palace Bill. Owing to a misconception on the part of the opposing counsel, who thought both Bills would be decided together, and that he could reserve his evidence until after that in favour of The Gaslight and Coke Company's Bill had been heard, the chemists called by the company were not cross-examined, while the opposing chemists were cross-examined by a learned Q.C., with Dr. Odling at his elbow. The opposing counsel made his speech at a time when he intended calling no witnesses, and therefore could not refer to anything in their evidence, and he certainly did not "distinctly put it aside," as it had at the time no existence. After hearing the evidence, however, the committee quickly decided in favour of the opposition.

When the Bill of The Gaslight and Coke Company came on, it was clearly understood that the only thing to be settled was whether that company were at any of their stations so situated that a nuisance to the neighbourhood was unavoidable. The assertion that the committee were willing to *give* the *company* 35 or 40 grains is inaccurate. The chairman particularly said he would *give* the company nothing; but if it could be *proved* that one section of the public must suffer from nuisance if another had good gas, a compromise might be effected—not as between the company and the public, but between those two sections of the public—by the gas consumers consenting to have a little more sulphur in their gas, the company paying for it by a reduction in the initial price, as they would supply an inferior article. The representatives of the consumers at once declined to accede to any compromise, and in the end the committee were convinced that the nuisance was not necessary, and threw out the Bill. As the chemical evidence was, at this point of the case, not in question, it is not surprising that Sir E. Beckett did not make much reference to it.

As to the evidence from Newcastle, &c., the question before the committee was—Can gas containing less than 20 grains of sulphur be habitually supplied without causing a nuisance? It was admitted that in April last, owing to an accident, the gas at Newcastle once contained more than 20 grains, and that on several occasions it contained nearly 20 grains; but it was proved to be, as a rule, under 15, and no nuisance was created. Therefore, although Mr. Versmann approaches very

closely to charging Mr. Pattinson with perjury, it is evident that he himself is under a mistake.

With regard to Dover, Mr. Versmann does not go quite so far, though he certainly charges Mr. Anderson with misrepresentation; but on this I would only remark that, until he has explained better than he has yet done the extraordinary results published by him in reference to the Commercial gas in 1860, the vaunting of his personal tests will be taken for what it is worth.

The engineer referred to by Mr. Versmann, in his attack on the Nottingham evidence, is too well able to take care of himself to make it necessary for me to say anything. It was positively sworn by Mr. Loam, that at Nottingham the gas contained, on an average, 15 grains of sulphur, and no nuisance was created. The theories of any one witness could not affect this.

Reverting for one moment to the chemical question, it is remarkable that the production of sulphuric acid, during the burning of gas, which the friends of the companies choose to speak of as an "exploded fallacy" (though when and by whom it was exploded they do not tell us) has been confirmed lately by Professor Silliman and M. Vérigo in investigations undertaken, not in the interests of either a gas company or a corporation, but for purely scientific purposes. They having arrived at the conclusion that in all probability no considerable portion of sulphurous acid escapes further oxidation to sulphuric acid, it is, at least, rash, in the face of such judges, to speak of the "exploded fallacy" of its production. In conclusion, I would remark that, bad as desiccation may be, desiccation, *plus* sulphuric acid, must be worse, and that no amount of desiccation will cover brasswork with sulphate of copper.

8, *Savage Gardens, July* 16, 1877. CHAS. HEISCH.

SIR,—In your issue of the 10th inst., Mr. Frederick Versmann puts himself forward as the defender of gas being supplied to the public, containing sulphur, and a critic of the witnesses on the late inquiry who took an opposite view. The name is somewhat new in gas affairs, and as it is one of some authority in other matters, let us hope to see it again.

The view that Mr. Versmann takes is not likely ever to prevail in this country, for however much sulphur impurities may be swallowed without remonstrance in Germany, there are authorities in this country, well known, and of some experience, who, acting, as they think, in the best interests of gas companies, believe that sulphur in gas, in any form, is objectionable, and retards the extension of our business, and who are, therefore, not likely to succumb to, or be frightened by, such an effusion as Mr. Versmann's, which, to put it mildly, is characterized more by passion than judgment. Mr. Versmann has, therefore, I think, cut himself out a pretty stiff job. I hope he will stick to it.

As one of the gas makers of this country, I may say that I am not aware that any of my brethren take Mr. Versmann's view. I think we all admit the objection to sulphur, but some of us find it difficult—impossible, if you will—to remove it without creating a nuisance. That was the whole question at the late parliamentary inquiry. No one ignored the evils of the presence of sulphur as Mr. Versmann, and, as he states, German authorities do, but held that it was expensive and difficult to extract, and that in doing it they could not avoid committing a nuisance.

From the time that Dr. Letheby discovered those sulphur impurities, there has been a constantly expressed desire to remove them. "We do not know how to do it;" "One day we have them within the prescribed limit, but the next day they will bound beyond it, and we know not why;" "Wait till we have constructed more apparatus;" "Wait until we have built our new works at Beckton, and the question will be settled to your satisfaction"—this is the substance of the remonstrances to the Gas Referees by the very company who called for the late inquiry on which Mr. Versmann animadverts.

The whole tenor of Mr. Versmann's letter is the contrary of this. His theory is: "Why all this trouble and bother? Why not go on as other people in Germany and in America do?" My answer is: Because either in those countries the gas may not contain so much of the impurities as ours does, or it may be that they do not know so much about the matter as we do; or, while knowing it, their feelings may not be so acute, and they may be willing to put up with what they consider a necessary evil.

The smell of gas is not the only one that a German can tolerate, but to which an Englishman objects. However learned German chemists and philosophers are, they have not managed to imbue their people with very high notions of the advisability of the application of sanitary science in and about their homes. They are improving in this respect by adopting English notions, through the complaints of English travellers; and I believe that the nineteen different and distinct smells which Coleridge described as a characteristic of Cologne have been diminished in number even in my time, for you can now traverse the passages of an hotel in search of a certain place without being able, as we were wont, to find your way by the nose.

Instead of deadening English feeling to the ills of life, I would rather awaken it; and believing that the doctrine taught by Mr. Versmann is retrograde, I protest against it, as calculated to send us to sleep, to stifle inquiry and improvement, and as bordering on what Mr. Versmann, when desiring to use a strong expression, calls a "degradation and prostitution of science."

Having now settled our aims, let us see how Mr. Versmann conducts his case. He writes: "I do not intend to dissect or analyze the recent proceedings—this would be too ungrateful a task." Indeed! Why? The proceedings are public property; the pointing out of errors, if done in a gentlemanly manner, is to be encouraged—is what, in fact, is wanted, and for what all inquirers are grateful. Mr. Versmann seems, however, to have very soon changed his mind, for he only writes four short paragraphs when he descends to this "ungrateful task." Now, I do not object to this change in his intentions, but I do object to the manner in which he has carried them out. More paltry criticism I have seldom seen—never from a man who acknowledges to act from a scientific basis. He finds fault with the chemist who tests the gas of Newcastle, for telling the committee that the gas there was well kept within the parliamentary limit of 17 grains (the average for 1876 was 11 grains), because that out of eight tests published by that same gentleman of his testings in April last, three of them were respectively 19, 18·54, and 30 grains. He does not tell us what the other five tests were, but it follows that if, with such variations in the month of April, an *average* of 11 grains can be maintained for a whole year, there must have been a great many testings considerably under even 11 grains; and the inference that a practical man will draw is that the three tests quoted are the only ones that suited his purpose—are unusual, and, being unusual, were rather to be omitted than quoted. They were more likely the result of accident or negligence than that of an unpreventible cause, and, therefore, an unsafe peg for Mr. Versmann to hang his theories on.

The next paragraph is devoted to the Dover witness—that is myself—which I would give in full. "The Dover witness, on the 16th of May, *boldly* stated, without giving *any proof whatever*, that the gas there, *and in other places* under his control, contained about 15 grains, against which *assertion* I adduce the fact that the Dover gas contained, within a fortnight from that time, from 29 to 35 grains, as ascertained by my own personal tests, extended over several days." I have italicized portions which require particular comment.

First, *boldly*. I am not aware that I exhibited any boldness—certainly no timorousness—but the manner in which I gave evidence is hardly worthy of a scientific critic, unless his object is merely to disparage.

More worthy—unworthy I mean—is the allegation that I made a statement "without giving any proof whatever."

I am here put in the dilemma of determining whether Mr. Versmann understands the meanings attached to the words "assertion" and "proof." What I stated was that several years ago I caused experiments to be made, at my Dover works, with the Letheby and with the Referees test, and the quantity of sulphur found was 15 to 16 grains; that latterly I had had tests made by Mr. Vernon Harcourt's test, because it was more easily done, and that the average of over 100 experiments was, &c. Is this no proof whatever? Unless I had brought the gas into the committee-room, and made the experiments (over 100 in number, mind you, and extending over months), I do not see what nearer proof I could have given.

But "what is sauce for the goose must be also sauce for the gander." Mr. Versmann writes that he went to Dover, and within a fortnight found, &c. He calls this a fact. I do not say that it is not; but is Mr. Versmann's statement of it any better, pray, or as good proof, as I gave? Byron wrote that "of all cants the cant of criticism is the most contemptible." I leave readers of the JOURNAL OF GAS LIGHTING to decide whether Mr. Versmann or I come the nearest to the poet's condemnation.

These experiments, made by my officers, were as likely to be correct as those made by Mr. Versmann, with the exception that I would suppose, although I do not know it, that he may be a better experimenter. They, however, had no interest in stating what was not true—we were not under those sulphur clauses—any experiments made were merely to compare results with what we found stated in other places. Moreover, we have always felt that the purer we made our gas the more of it we should sell. Had any large quantities been found, the application of a remedy would have lain with me; no odium could have attached to them; and I gave results made by one officer years ago, and those by another officer made this year. I am not inclined to doubt their statements as being inaccurate in any appreciable degree. We do see that at Newcastle, where the average of the year is 11 grains, the maximum sometimes rises far above that amount. What arises at Newcastle may arise at Dover, and this is the most charitable construction I can put on the discrepancies between the tests made by my disinterested officers and the seemingly interested Mr. Versmann.

Having already occupied, perhaps, too much space, I would desire only to put a few questions before I finish.

Sulphur is either beneficial or it is injurious. Sulphur combined with hydrogen no one will permit to be in gas. Why? Because the products of combustion are most distasteful. Are, then, the products of combustion from sulphur combined with carbon less injurious? Is it the body with which the sulphur is combined, or is it the sulphur, that produces injurious effects? These are questions that admit of a specific answer, and on the answer depends the whole question at issue.

It will not do for some laboratory chemists to set themselves on too high a pinnacle, and pooh-pooh such men as the experienced and world-wide known gentleman who stated the case as regards the Nottingham Gas Company.

Without desiring for one moment to decry theoretical knowledge of any kind, I must remark that it is not your laboratory or your college bred men who have made this country great in the applications of science, but practical men who have struggled and fought their way, trammelled by both poverty and defective education. Neither Stevenson, Watt, nor Faraday were "born with silver spoons in their mouths;" yet if we were to subtract from the doings of this age the effects of such men as these, we should leave very little worth having of all the results of all the universities.

To some men it is given to look Nature straight in the face, and interrogate her with success; others there are who can only look at her through a veil of school formularies, which, even if correct, are often misapplied for want of genius.

Mr. Versmann will do well, in any future communications, not to mind the man nor his manners, but listen to what he says, and controvert him as often as he can; and also, if he can, just admit a small grain of sincerity in other people. I can assure him that there are some of us who are not the mere hired advocates he seems to suppose, nor do some of us jump at the first cause that comes to us, but make our selection, rejecting those we cannot honestly support, knowing that in the differences of opinion that exist it is unlikely that a cause will fail through want of finding some one to agree with it. And speaking for myself, and as a gas manufacturer, I would ten thousand times sooner be on the side that is looking forward to progress, and to improvement, than on that of stagnation, laziness, and ignorance.

I do not despair of the sulphur impurities being removed from gas, neither do I want sympathy for those upon whom the difficulty is now thrown of trying to do it—and I believe, hitherto, with inadequate means; but knowing, as I do, that it can be done, and that it is now only a question of nuisance, I could neither commit the folly nor the

meanness of advocating a stand-still, do-nothing policy, as if we had arrived at the end of all knowledge, and had now nothing to do to the end of our lives but sit down and reap the fruits planted by our ancestors.

35A, *Great George Street, Westminster,*
July 16, 1876. GEORGE ANDERSON.

GAS *VERSUS* ELECTRICITY.

SIR,—The recent scare among the holders of gas shares is a matter which calls for more serious attention than it seems at present to have received. The capital at this moment invested in this country in gas undertakings represents a sum very little short of eighty milllions sterling. Now, for so vast an amount of property to be subject to such rapid depreciation as took place a few days ago on the London Stock Exchange proves one of two things—either that gas proprietors have but little confidence in the stability of the business in which they are engaged, or that they are but imperfectly acquainted with the technicalities of the process in which they have embarked their money. I think the latter is the more universal cause of the panics which every now and then take place among the shareholders in gas property. Let any newspaper writer give a highly-coloured description of some experiments with a new light, and forthwith a hundred embryo philosophers start up to sound the praises of the new luminary, and prognosticate the extinction of the old lights and all their disagreeable accessories; shareholders take fright, and soon become the victims of a host of unscrupulous speculators.

In looking back over a professional career of some forty years, I can distinctly remember a few of these panics. We have had Lime and Electric lights, Bude and Boccius' lights, Payne's, White's, Mongruel's, Patent, New, Air, and Eupion gas, and now we are to have another new light in the shape of the "electric candles." Surely, after sixty years experience, the proprietors of gas-works should be acquainted with the practical details of their business, and ought to be so far posted up in the progress of science as to be able to judge of the value of any process submitted for public approval, and thus either accept the new discovery as an improvement on their old mode of working, or else show their confidence in their proceedings by maintaining the value of their property, and not scamper off like flocks of frightened sheep when they hear some one trying to play an old tune on what appears to be a new instrument.

What are the facts connected with the so-called "electric candle" that prove it to be more applicable for domestic lighting than any previous form of electric light? It is true the adjustment of the carbon points may secure greater permanency in the light itself; it may also be true that the magneto-electric apparatus is more perfect, and, therefore, the cost of producing the electric current greatly reduced, but the light obtained from such a source will always remain one of *intensity*, and not one of *quantity*, and hence it must be a light only adapted for situations where great penetrating power is requisite. We hear of electric lamps of 100, 200, 300, and 400 gaslight power. I have recently seen some of these lamps, and I have no hesitation in affirming that, for all manufacturing purposes involving any ordinary amount of manipulative skill, for halls and public assemblies, for shops and stores, and especially for rooms in private houses, such lights are totally useless unless the intensity of the light is modified and subdued by the intervention of screens, diaphragms, reflectors, or some mechanical arrangement to render the light more diffusive. Only those who have experimented with lights of intensity are able to judge of the great difficulty there is in rendering such a mode of illumination available for ordinary purposes.

I cannot better illustrate the position these lights bear to the light furnished by gas, oil lamps, candles, &c., than by taking the action of a powerful locomotive on one of our great railways. This mechanical horse drags a load of 500 or 600 tons with a speed and regularity perfectly unattainable by the expenditure of any amount of animal power; it does its work effectively and economically; but suppose the same machine were put to do work that could be easily performed by a couple or three horses, it is perfectly clear the cost of doing such work by the engine would be out of all proportion to the results so obtained. Just so with these powerful lights. You may produce the light of, say, 100 gaslights, and this light will penetrate to a very long distance, and brilliantly illuminate all objects falling within the path of its rays; the power expended in producing such a light may possibly be in exact proportion to the result obtained; but suppose it were necessary to produce a light of only 10 gaslights instead of the 100, the question then is, Will the expenditure of one-tenth of the power produce one-tenth of the light? Certainly not.

All experiments up to the present moment simply prove that the electric light, the lime light, and all lights of intensity, are only capable of being produced in such a way as to afford illumination greatly in excess of that required for ordinary domestic purposes. A knowledge of these facts ought to satisfy shareholders in gas-works that it is not by the introduction of any such modes of lighting, as that of electricity or the lime light, that they need apprehend any depreciation of their property.

If I may offer a word of advice to the directors and shareholders of gas companies, I would say, let them encourage a higher standard of technical ability in their engineers and workmen, and they will soon find they need not fear the introduction of any invention, however imposing its pretensions may be. Let a spirit of scientific inquiry be encouraged among practical gas men, and they will keep the process of gas-making well up to the requirements of the age; if they are men of education, they will accept and adopt improvements in the practice of their profession, let them come from whatever source they may. They will thus protect the property of their employers against all such sudden and uncalled-for depreciations as that recently experienced by the shares of metropolitan and some foreign gas companies.

Camden Town, July 19, 1877. HENRY GORE.

STEAM-JET EXHAUSTERS.

SIR,—In continuation of the subject of my letter which appears in your columns of the 10th inst., I shall first criticize the following passage of Mr. Paterson's paper:—

"The effective work of the slow-speed condenser is not more per unit of surface than that of a horizontal or screw arrangement, or even of a vertical one where the gas has an ascending motion."

In the paper on "The Economy of Force in Gas-Works," read before the British Association of Gas Managers at Leeds,* I wrote as follows:—

"The superior efficiency of the slow-speed condenser, as a cooler merely, is due to the fact that the currents of air on the exterior, arising from the heat of the gas, are invariably upward; and the current of cooling gas being downward, you have the coolest air acting on the coolest gas, and *vice versâ*. As the heat of the air derived from the gas is, in all parts of its ascent, lower than that of the gas it is acting on, it continues to extract heat along the entire length of every pipe. Moreover, the heat radiated by this condenser falls on surfaces of temperature nearly equal to itself, so that there is merely an interchange of heat of the same degree, and no warming of cold pipes by the heat from warm ones. In the slow-speed arrangement, the heat, being at the top, is in the best position for being extracted by every breath of wind. Compare this with what takes place in the zig-zag arrangement.

"If the condenser is vertical, you have at the foot of the up-pipes cold air surrounding a warm pipe, ascending and distributing the heat along the part, giving back to the upper part, where we want it cold, a part of the heat it has taken from the lower portion. The effect from radiation is almost as awkward. The heat of the up stream radiates from the lower parts into the next pipe in advance, which we want to cool, while the heat from the upper parts of the down stream performs the same kind office for the next in advance. The horizontal zig-zag is not open to this objection as regards heat conveyed by circulation; but the effect of radiated heat on it is much the same as with the vertical arrangement."

"But," the reader might reply, "all this is only argument. Facts are facts, sir. What do you say to the figures given by Mr. Paterson?"†

I shall not question the correctness of those figures, but I am compelled to question whether their real signification has been understood, and to dissent wholly from the conclusions drawn from them.

The gist of the author's reasoning, if I read it aright, is this: If you cool a stream of gas by passing it through a series of pipes or other apparatus, exposed to the atmosphere, and observe the temperatures as it passes through various parts of the series, you will have, in the differences of those temperatures, a simple measure of the cooling power of the respective parts per unit of service. Now this is a fallacy, as any reader may see by a simple experiment. Let him take two tumbler glasses, of the same make and size; place a thermometer in each; fill one with water at about 200°, the other with water at about 100°; place them in a room where there are no draughts, or other disturbing causes and note the rate per minute at which the mercury falls in each glass. He will find, as he probably expects, that the mercury in the hottest water falls much more rapidly than the other, although the quantity of water and the cooling arrangements are the same for both, and that, therefore, the rate of cooling cannot be a measure of the respective cooling power of his two tumblers.

In Clegg's "Treatise on the Manufacture of Gas" (fourth edition, page 171), a table is given, which we may assume to be correct, and from which we learn that the heat lost by gas-condensers, when radiating in air, is nearly in arithmetical ratio to the difference of temperature between the gas and the air. Let us apply this rule to Mr. Paterson's figures.

We learn from the first table in his paper that the mean temperature at the outlet of exhauster and inlet of horizontal condenser was 143·2°, the mean temperature of the atmosphere being 51·8°, giving a temperature difference of 91·4°. The cooling surface of that condenser is 1311 square feet, the loss of temperature between inlet and outlet, 39·8°, giving 33 square feet of surface per degree of heat lost. The mean temperature at the outlet of horizontal and inlet of slow-speed condenser was 103·4°, atmosphere 51·8°, giving a temperature difference of 51·6°. In this, 38 square feet of cooling surface were required per degree of heat lost.

Now, the heat lost being nearly in arithmetical ratio to the difference between the temperatures of gas and atmosphere, other circumstances being supposed equal, the loss of heat by the slow-speed ought to be less rapid than by the horizontal condenser, in the proportion of about 51 to 91; and, the horizontal requiring an average of 33 square feet of surface per degree of heat lost, with a temperature difference of 91·4°, the slow-speed condenser, with a temperature difference of only 51·6°, ought to require about 58·5 square feet of surface per degree of heat lost. But it really required only 38 square feet. Therefore (38 : 58 :: 100 : 152) a slow-speed condenser, if tried against a horizontal condenser in exactly similar circumstances, would, according to Mr. Paterson's figures, when rightly understood, prove itself about 52 per cent. superior in cooling power.

Experience confirms the claim of the primary slow-speed condenser, with its patented improvements, as used here, to very high efficiency as a gas-condenser and purifier. The following figures, noted at random since reading the paper under review, are offered, in evidence of its cooling power merely:—

Date.	Proportion of Normal Mid-Winter Make.	Temperature, Outlet. A Condenser.	Temperature, Outlet. C Condenser.	Temperature of Atmosphere.
		Degrees.	Degrees.	Degrees.
July 8, 1877	5-16ths.	57	59	58
July 9, ,,	5-16ths.	61	62	61
July 11, ,,	6-16ths.	61	63	61
July 12, ,,	6-16ths.	63	64	63
July 13, ,,	6-16ths.	64	63	64
July 14, ,,	6-16ths.	64	64	63
July 16, ,,	7-16ths.	59	59	60
July 17, ,,	7-16ths.	61	62	60
July 18, ,,	7-16ths.	62	60	57
Mean temperature . .		61·3	61·8	60·8

Mean temperature of A and C = 61·5°; difference between gas and air, 0·7°.

The strength of the liquor delivered by these condensers, which has

* See JOURNAL, vol. xxvi., p. 74.

† See JOURNAL of 26th ult., p. 1023, second paragraph.

ranged during the above period from 8° to 14° Twaddel, indicates their efficiency as purifiers, when contrasted with horizontal quick-speed condensers. Although the latter are specially designed to keep the gas in contact with the condensed liquors throughout their entire length, I am informed, by those who use them, that their condenser liquor at the outflow is only about 4° Twaddel.

All that I have written above is equally applicable to the steam scrubber, when regarded as a cooler merely. The two apparatus are built on the same lines, only the internal furniture being different. In answering the objections made to one apparatus, I have, therefore, answered those made to the other from the same point of view. But, in the paper and discussion, objections have been made to the steam-scrubber on other grounds. Mr. Paterson considers that the difficulty in regulating the flow of gas through the different columns, and the liability to "clogging" by deposits of "pitchy matter," "entirely preclude its adoption." I must say that in three years almost continuous working of a "steam-scrubber" here, the pitchy objection has not been felt in the slightest degree as a practical difficulty. The resistance to the passage of the gas through the apparatus is seldom over 1-20th part of an inch, and never over 1-10th, frequently only 1-40th part, as indicated by one of King's gauges, connected both to the outlet and inlet. As to the difficulty of securing an equal flow of gas through the various pipes, a flow sufficiently near equality for all practical purposes, we do not even find regulating-valves necessary for that purpose, and consequently do not now introduce them, but substitute smaller throttle-pipes.

The most serious objection to the steam-scrubber is that brought forward in the discussion by Mr. Morton, who says that, while I claim that it practically takes out the whole of the ammonia, he finds that, under the most favourable circumstances, something like 50 grains of ammonia per 100 feet of gas are still left. This is astonishing. I cannot give the grains of ammonia left in our gas after passing the steam-scrubber, having never considered the game worth the candle, and being content to know that the trace left entirely disappears in the first oxide of iron purifier. That it is but a "trace," and that the gas is "effectually purified from ammonia," in the ordinary meaning of these words, the reader will readily conclude, when he is informed that, under ordinary circumstances, on holding moistened turmeric paper in a jet of the gas, under one inch pressure, from one to ten minutes are required to discern the slightest change of colour. Probably, a second or less would suffice with gas containing "50 grains of ammonia per 100 feet."

I am not in a position to state positively the causes that have led to Mr. Morton's unsatisfactory results, and shall therefore speak in general terms. Assuming, then, that the jet exhauster and steam-scrubber are preceded by an efficient condenser—so that the work of primary condensation, particularly the separation of tar, may not be thrown on the scrubber in addition to its proper work—the question of much or little ammonia at the outlet resolves itself into the simple elements of temperature, speed, extent of scrubbing surface, and equal distribution of gas and liquor. If in all or any of these particulars the conditions were unfavourable in comparison to those maintained here, it was natural that the results should be proportionately unfavourable. My own opinion, which is no news to Mr. Morton, is, that his steam-scrubber was over-worked from the beginning.

As to the cooling power of these scrubbers, the following figures may interest your readers:—

Date. — 1877.	Proportion of Normal Mid-Winter Make.	Temperature of Scrubber Inlet. Degrees.		Temperature of Scrubber Outlet. Degrees.		Temperature of Atmosphere. Degrees.	Columns of Steam Scrubbers, 27 Feet in Height.
July.		A.	C.	A.	C.		
13	6-16ths.	—	—	68	68	64	About one-third of height of columns perceptibly warmer than the atmosphere.
14	6-16ths.	—	—	63½	63½	63	
16	7-16ths.	128	128	59	59	60	
17	7-16ths.	127	127	60	60	60	
18	7-16ths.	—	—	60	60	57	
18	14-16ths.	Idle.	121	Idle.	66½	58	About two-thirds ditto ditto.
19	7-16ths.	—	—	60	60	57	About one-third ditto ditto.
19	7-16ths.	127	128	60½	62½	66	
20	7-16ths.	—	—	59	60	61	
20	14-16ths.	129	Idle.	60	Idle.	61	About two-thirds ditto ditto.
Mean temperature . . .		127·7	126·0	61·1	62·2	60·7	

Hitherto no satisfactory statement has been made public as to the saving in material and wages effected in purifying gas from sulphuretted hydrogen, by using the "Linacre method" of condensing, exhausting, and scrubbing, although it has long been apparent that it is very considerable. In a careful comparative trial recently made on the manufacturing scale, and lasting six weeks, it was found that the "steam gas" required one cubic foot of fresh oxide of iron to be once used, to purify 7175 cubic feet of gas; while the "common gas," simultaneously made from similar material, required the same oxide and use to purify 4773 cubic feet; in other words, the saving in oxide, and, consequently, in labour, &c., amounts to one-third. But one-third saved while using fresh, or nearly fresh, oxide is in all probability considerably beneath the total saving to be effected throughout the duration of the oxide; for the difference is doubtless due in part to the almost total arrest of all oily, tarry, and aqueous matters by the steam-scrubber; and the obstructive action of these matters in protecting the oxide from the action of the sulphuretted hydrogen in "common gas" will be greater the more frequently the oxide is put into the purifier.

Linacre, Liverpool, July 20, 1877. WM. CLELAND.

HALESWORTH GAS COMPANY.—The annual meeting of shareholders was held on the 13th inst., when a dividend at the rate of 10 per cent. was declared.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 16, 1877.

A report was read from the Select Committee on the Local Government Board's Provisional Orders Confirmation (Bishop Auckland, &c.) Bill, that it is not expedient to proceed further with the West Houghton Order, and that the promoters of the Bishop Auckland Order do not intend to proceed further with the same during the present session. The Bill was accordingly reported with amendments.

The Christchurch Gas and West Surrey Water Bills were read the third time, and, amendments having been made, passed.

The Tudhoe and Sunderland Bridge Gas and the Ramsgate Local Board Bills were read the third time, with the amendments, and, further amendments having been made, passed.

TUESDAY, JULY 17.

The following Bills were reported, with amendments:—Carnforth District Water; Coatbridge Gas; Colne Gas; Glasgow Corporation Water; Leeds Improvement; Leicester Gas; Louth Gas; North Cheshire Water; Southend Gas; Sunningdale District Water; Wakefield Gas; Woolwich, Plumstead, and Charlton Consumers Gas.

THURSDAY, JULY 19.

The Commons amendments to the Lowestoft Water, Gas, and Market Bill were considered and agreed to, with amendments.

The Commons amendments to the East Worcestershire Water Bill were considered and agreed to, with an amendment.

The following Bills were reported from Select Committees, with amendments:—Ashton-under-Lyne Gas; Bishop Auckland District Gas; Perth Water; Waterford Gas.

The following Bills were reported with amendments:—Bridgwater Corporation Water; Carshalton Gas; Croydon Commercial Gas; Epsom and Ewell Gas; Newcastle-under-Lyme Borough Extension and Improvement; Stretford Gas; Thanet Gas.

The Local Government Board's Provisional Orders Confirmation (Bishop Auckland, &c.) Bill, now the Local Government Board's Provisional Orders Confirmation (Hyde, &c.) Bill, was considered in committee of the whole House, and amendments made.

FRIDAY, JULY 20.

The Kent Water and Wakefield Improvement Bills were reported with amendments.

The following Bills were read the third time, with the amendments, and passed:—Carnforth District Water; Coatbridge Gas; Heywood Water; Leicester Gas; North Cheshire Water; Southend Gas; Wakefield Gas; Woolwich, Plumstead, and Charlton Consumers Gas.

The Commons amendments to the Blackburn Borough Gas, Water, and Extension Bill were considered and agreed to.

The amendments to the Local Government Board's Provisional Orders Confirmation (Hyde, &c.) Bill were reported.

HOUSE OF COMMONS.

MONDAY, JULY 16.

The Blackburn Borough Gas, Water, and Extension, and the Londonderry Gas Bills (Lords), as amended, were considered.

SOUTHWARK AND VAUXHALL WATER SUPPLY.

Colonel NORTH asked the President of the Local Government Board if his attention had been called to the report of Dr. Frankland upon the water supplied by the Southwark and Vauxhall Company, that it was "full of moving organisms, and contains an excessive proportion of organic impurity;" and if he will take steps to ensure a supply of pure water from that company.

Mr. SCLATER-BOOTH said: My attention has been called to the recent report of Dr. Frankland to which my honourable and gallant friend refers. But complaint had previously been made to me by the Wandsworth District Board of Works as to the state of the water supplied by the Southwark and Vauxhall Company, which has for some time been unsatisfactory, and the Water Examiner has, by my directions, been in communication with the company on the subject during the last two months. On the 4th of July last I issued an order directing that a special inquiry, under sec. 35 of the Metropolis Water Act, 1871, should be held by Major Bolton, and that inquiry will commence immediately. It is fair to add that the company have been incurring a large expenditure during the past year for the renewal of their filters at Hampton and Battersea, a work which they admit to have been too long neglected. It remains to be ascertained what further works may be necessary to put this company's supply into a satisfactory state.

TUESDAY, JULY 17.

The Gas and Water Orders Confirmation (Abingdon, &c.) Bill (Lords) was considered in committee of the whole House, and reported without amendment.

WEDNESDAY, JULY 18.

The Gas and Water Orders Confirmation (Abingdon, &c.) Bill (Lords) was read the third time and passed, without amendment.

THURSDAY, JULY 19.

The Blackburn Borough Gas, Water, and Extension, and the Londonderry Gas Bills (Lords), were read the third time and passed, with amendments.

PUBLIC HEALTH (METROPOLIS) BILL.

The order for the second reading of this Bill was read and discharged, the Bill being withdrawn.

THAMES RIVER (PREVENTION OF FLOODS) BILL.

Mr. GORDON asked the senior member for Chelsea whether it was his intention to take any other step for the purpose of bringing under the notice of the House the course pursued by the Metropolitan Board of Works with reference to the Thames River (Prevention of Floods) Bill, having regard to the opposition offered to his motion on the subject by the chairman of that Board.

Sir C. DILKE said it was quite true, as implied in the question of his honourable friend and colleague, that the opposition of the honourable and gallant member for Truro had prevented, owing to the operation of the half-past twelve o'clock rule, his bringing forward his motion in favour of altering and proceeding with the Thames River (Prevention of Floods) Bill. The honourable and gallant member had refused to proceed with the Bill, and nothing would now be done to prevent the continuance of these floods, the responsibility for which would be at the door of the majority of the Metropolitan Board of Works. He might, however, possibly find an opportunity for making some remarks upon the subject upon the second reading of the Metropolitan Board of Works (Money) Bill, which stood for second reading on the 28th inst.

FRIDAY, JULY 20.

The Lords amendments to the Ramsgate Local Board and West Surrey Water Bills were agreed to.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

SATURDAY, JULY 14.

(*Before the* MASTER OF THE ROLLS.)

In re THE HOME AND FOREIGN GAS LICENSING COMPANY, LIMITED.

Mr. WARD appeared for Lloyd's Banking Company, and Mr. E. BEAN was for the petitioning shareholder. The gas company were not represented.

This case came before the Master of the Rolls upon two petitions for the winding up of the company. One of the petitions, which was by a shareholder, named Bennett, had been originally set down before Vice-Chancellor Malins, but had been transferred to this Court, where the second petition, which was by Lloyd's Banking Company, had been filed. The company were formed for the carrying out of an invention for extracting hydrocarbon gas from coal and petroleum, and they had contracted to light with their gas the town of Brewood, near Walsall. An execution had been put in by Lloyd's Banking Company upon the Gas Company's property, at Brewood, including the mains, pipes, and street-lamps; and, in order to save the town from the danger of being plunged into darkness, Vice-Chancellor Malins had granted an injunction, preventing the execution creditors from selling the property.

The MASTER of the ROLLS made the usual winding-up order on both petitions.

FRIDAY, JULY 20.

CORPORATION OF BIRMINGHAM *v.* ALLEN AND ANOTHER.

Mr. CHITTY, Q.C., and Mr. W. P. BEALE appeared for the plaintiffs; Mr. INCE, Q.C., and Mr. SPEED for the defendants.

This action was brought by the Corporation of Birmingham, as owners of the gas-works at Swan Village, against a neighbouring firm of colliery proprietors. On the 5th of May, 1876, the plaintiffs moved for an injunction to restrain the defendants from working the coal near to the site of their gas-works, so as to cause subsidence of the surface, and consequent injury to the buildings erected thereon; but the motion was directed to stand over until the hearing, on an undertaking given by the defendants not to work their coal within a certain distance of the gas-works in the meantime. At the trial of the action last March, the Master of the Rolls dismissed it with costs, and referred it to the official referee to inquire what damages, if any, the defendants had sustained by reason of the temporary stoppage of their workings, in accordance with the undertaking given by them at the hearing of the motion. This decision was affirmed on appeal, and the official referee reported in due course that damage had been sustained by the defendants, and that the same amounted to the sum of £2042 4s., without stating the facts of the case, or his reason for so finding. Motions were made, on behalf the plaintiffs, to vary the report, and, on behalf of the defendants, to confirm it; but the Master of the Rolls adjourned the motion until this day, and referred it in the meantime to the official referee, to certify of what items the amount was made up, and for what reasons he had allowed them, which in his report he had not done.

The MASTER of the ROLLS said in the present case the official referee had merely reported a lump sum as due to the defendants for damages, and thereupon these motions were made. It was obviously impossible for the Court to discuss the question in dispute without knowing either the mode in which the official referee calculated the amount, or the facts on which the calculation was based. His lordship was entitled to be informed of those facts, because the official referees were appointed to assist the Court on questions of fact, and not to decide any case finally, but merely to report on it, and leave the decision to the judge. His lordship had, accordingly, directed a communication to be made to the official referee, and that gentleman had, in response, supplied a most complete and elaborate report, containing every fact, and giving to the Court his reasons. His lordship then discussed the case with some minuteness, and gave his reasons for reducing the amount to £1549 5s. 4d.

THURSDAY, JULY 19.

(*Before Vice-Chancellor* HALL.)

CORPORATION OF LEAMINGTON *v.* OLDHAM AND ANOTHER.

This was a motion on behalf of the plaintiffs to restrain the defendants from causing or permitting water to be taken from a culvert draining the surface of land called Welsh's Meadow, lying to the east of Leamington, or from any other source, to be pumped into the reservoir from which the town of Leamington is supplied, until the same had been passed through the filter-beds provided for the purpose, or had been otherwise effectually filtered and cleansed.

Mr. ROBINSON, Q.C., who appeared for the plaintiffs, said that the defendants, Messrs. James and John Oldham, were a firm of contractors, who in the year 1856 entered into an agreement with the plaintiffs for the supply of water to the town of Leamington for drinking and domestic purposes. Their agreement provided that they should, within nine calendar months, erect the necessary machinery and appliances, including filtering-beds for supplying water to the town, and for pumping, filtering, and supplying it into the mains of the corporation, and thence into reservoirs constructed by the defendants, conveying the water to a height of 134 feet above the level of the weir at Leamington Mill, in quantities not exceeding 500,000 gallons daily. The clause under which the injunction was asked was to this effect:—"And that they (the contractors) shall and will cause all the water supplied by them to the local board to be properly and effectually filtered and cleansed by means of the filtering-beds, to be constructed and maintained by them, from all mechanical impurities, so far as by such means such filtering and cleansing can be effected." It appeared that of late, chiefly owing to its being permitted to pass through a certain culvert, the water had been by no means free from impurities; and the learned counsel stated that one of their witnesses had found at dinner a live leech an inch long in his water-bottle, and that another witness could testify to the presence in water supplied to him of a decomposed eel.

Mr. GRAHAM HASTINGS, Q.C., for the defendants, said that they had not used the culvert in question, and did not intend to do so; that they were quite ready to enter into an undertaking that the water should be properly passed through the filter-beds, for it was their practice so to filter it, any impurities in the water being accounted for by the neglect of the town to provide proper storeage.

After some discussion it was arranged that the defendants should give an undertaking which was substantially in the terms of the notice of motion, and that the motion should stand over to the hearing, with liberty to advance the cause.

DEVON SUMMER ASSIZES.—EXETER, SATURDAY, JULY 14.

(*Before Justice* LINDLEY.)

INDICTMENT OF A GAS COMPANY FOR NUISANCE.

The Budleigh Salterton Gas Company were indicted for creating a nuisance, but on the case being called, Mr. LEWIS stated to the Court that as an arrangement had been come to, no evidence would be offered, and with his lordship's consent a verdict would be given for defendants.

Mr. H. CLARK assented to this course, and, by direction of his lordship, the jury then returned a verdict of "Not guilty."

EXETER PETTY SESSIONS.—TUESDAY, JULY 17.

(*Before Mr.* E. A. SANDERS, *Chairman, and other Magistrates.*)

CONVICTION OF THE EXETER GAS COMPANY FOR NUISANCE.

The Exeter Gas Company appeared to a summons taken out at the instance of the Town Council of Exeter, for creating a nuisance at their works.

Mr. BUCKNILL, who appeared to prosecute, said the summons had been taken out under the 114th section of the Public Health Act, 1875, which provided that "where any manufactory, building, or place used for any trade, business, process, or manufacture causing effluvia, is certified to any urban authority by their medical officer of health, or by any two legally qualified medical practitioners, or by any ten inhabitants of the district of such urban authority, to be a nuisance, or injurious to the health of any of the inhabitants of the district, such urban authority shall direct complaint to be made before a justice, who may summon the person by or on whose behalf the trade so complained of is carried on, to appear before a Court of summary jurisdiction." It also provided that upon such summons "the Court shall inquire into the complaint, and if it appears to the Court that the business carried on by the person complained of is a nuisance, or causes any effluvium which is a nuisance or injurious to the health of any of the inhabitants of the district, and unless it be shown that such person has used the best practicable means for abating such nuisance, he shall be liable to a penalty not exceeding £5, nor less than 40s.; and on a second or any subsequent conviction to a penalty double the amount of the penalty imposed for the last preceding conviction; but the highest amount of such penalty shall not in any case exceed the sum of £200." Now the charge made against the gas company was that they had a manufactory or building such as that stated in the section, which was certified to be a nuisance and injurious to health. The Town Council appeared in this case upon a memorial signed by ten inhabitants of the district, and the Act stated that when that memorial was presented to the board "they shall take proceedings." In fact, the authority had to exercise no discretion in the matter—they were bound to take out a summons that the matter might be brought before the Court in the manner in which it had been done. It was probably known to every person in the Court that this was the second prosecution which had been commenced against the company for a nuisance. The first prosecution failed—why, he would not say, though he had his own opinion on the subject. The corporation did not then call scientific evidence, but contented themselves by calling persons who had experienced the nuisance complained of. They had, however, now the evidence of a gentleman of high scientific attainments—Mr. Stevenson—who had visited the defendants premises, watched their operations from beginning to end, and made a report thereon. It was felt that something should be done by way of stopping this terrible stench, which was called "the stink of the city," which had driven people from the city, and had prevented people from coming to the city. He would read the report made by Mr. Stevenson, and also a report made on behalf of the company by Mr. Spice. He was told by some persons that the company had cried *peccavi*, and were carrying on improvements. He did not know what the nature of those improvements was, but the nuisance continued, and it positively made people vomit, and was injurious to health. Moreover, it was a smell which might be prevented, for the escape of sulphuretted hydrogen, which was the cause of the nuisance, was an evidence of the greatest neglect on the part of the company. He should have no difficulty in proving that the company were able, and should be made, to keep the smell within their walls. The learned counsel, having read the reports just referred to, proceeded to describe the process of manufacturing gas, in every department of which he asserted the Exeter Gas Company were miserably incomplete as regarded their apparatus. The whole system, from beginning to end, was utterly incomplete. It was insufficient to meet the demand, the apparatus was too small, and, as Mr. Stevenson said, it was a great wonder there was not an incessant nuisance instead of only an occasional one. The report of Mr. Spice was a most flippant one. He need only tell them that it contained quotations from Burns and from the Scriptures—that the Town Council were compared to Ahab, the gas company to Naboth, and the gas-works to Naboth's vineyard—that Captain Thompson and others were called Joseph and his brethren—and that Mr. Stevenson, like Nelson, when he did not want to see a signal, put his blind eye to the telescope. It was evident Mr. Spice's report was written with a view to laugh the case out of Court. Reading the report of Mr. Spice, the learned counsel said the scrubbers were insufficient, and the purifiers were not in the right place. Could there be a stronger admission than "the purifying apparatus is not so large and powerful as it ought to be?" What was the effect of that? If there was an insufficient number of purifiers they must necessarily be changed more frequently than otherwise. When they were opening the purifiers to extract the lime from them, and the purifiers were charged with sulphuretted hydrogen, they were inflicting upon the people in the neighbourhood the smell of that impurity. Was that carrying on the works as they should be conducted? He should tell them, by the evidence of Captain Thompson, who went down to the works on several occasions, that he perceived heaps of impure lime which had just been taken from purifiers, and that the smell was something unbearable. Could there be anything stronger than an admission of incomplete works? The prosecution did not complain that the gas was not ample for the supply of the houses, but they complained of the manner in which that gas was produced. They might with justice condemn Mr. Spice's report as flippant. He had shown them the plain report sent down by Mr. Stevenson. He should call evidence to show the existence of the smell, that it arose from sulphuretted hydrogen, that it was injurious to health, and that it ought not to escape from any gas-works. If it was injurious to health, he submitted that the company had brought themselves under the Act, and had not used the best practicable means to prevent the escape. It could not be a matter of wonder, nor of surprise, that this terrible smell was felt by the people of Exeter. No doubt his friend who appeared for the company would say that they were putting themselves in order, and that it was very hard and unjust to issue this summons. But that was not a fair way to put it. It was all very well to talk of intentions and promises—promises might be kept, but, unfortunately, they were sometimes broken—and he should, therefore, ask the Court, on the evidence he should lay before them, to convict the defendants, and thus protect the citizens of Exeter from being exposed any longer to this horrible stench.

Captain *C. Hulford Thompson* was then called. He said: I reside at No. 9, Colleton Crescent. I am well acquainted with the works of the Exeter Gas Company, and have had every opportunity of inspecting them. On the 16th of January last, about seven o'clock p.m., the doors and windows of my house being closed, I smelt a smell as of rotten eggs. I opened the door, and the house was immediately filled with it. The wind being about S.S.E., I knew that the smell came from the gas-works. It was the smell of gas liquor, and was most sickening. On the following morning I went to the gas-works and found considerable stench within

the works. Finding no reason for the smell, I said to the manager, "You were poisoning the neighbourhood again last night," and went out. I was called back by the manager, who said, "The fact is, sir, there was an accident with the exhauster last night; it broke down. The effect was to burst open the retorts. If you'll come with me I'll show you." I went with him to the retort-house, and saw smoke issuing from the retorts in a way I had not seen before. It was a yellowish black smoke. The manager also told me that the stench the previous night had been so bad that they had some difficulty in getting the men to work. He said the exhauster broke down a little after six. For the next three or four days the smell continued very bad, and on the 18th of January it was so bad that I again went down to the works about five o'clock in the evening. I found a considerable stench all over the works, particularly in the neighbourhood of the scrubbers. I took some test-paper and held it over one of the tar-pumps, and it came away black, as it is now produced. It was perfectly white when I put it in. I very nearly vomited as the result of holding the paper over the pump. The smell is not like that of hides or salt fish. It is like nothing but rotten eggs. I went to see the works again on the 15th of February, and found a very large heap of gas lime. It was not there the week before; it was uncovered, and lying in front of the purifiers. It was of a deep pea-green colour, and it stunk horribly. On the 3rd of March the smell was bad, but from the 3rd to the 18th the wind was not from the gas-works, and there was no smell. On the 18th it shifted, the vane pointing direct to the gas-works, and I then noticed that the smell was coming through the window. I went to the front door, and felt a sickening stench, and called the attention of the churchwardens and Mr. Jones to it. When the wind has been from the gas-works I have almost invariably smelt this smell, but not when the wind has been towards the works. I have been unable to sleep owing to the smell.

Cross-examined by Mr. PITT-LEWIS (for the company): I will undertake to say that on one occasion within the last six months I have been awakened by a smell, and kept awake by it. I can put my finger on the tar-pump where I placed the paper, and say that it causes a stench. That pump pumps up both tar and ammoniacal liquor, and I think that could be done without causing a smell. In fact, I know it has been done. At one time I thought the smell was from Bradshaw's works, where they made asphalte. I was active in getting up a memorial to the town council. The memorial was against the purchase of the gas-works by the corporation, and was signed by 2000 inhabitants. I am opposed to the purchase, as I do not wish to see the city burdened with these works.

Re-examined by Mr. BUCKNILL: The smell from the asphalte-works is that of tar, and not anything like rotten eggs.

Mr. *James Coombes*, a gardener residing near Colleton Crescent; Messrs. *Ashford* and *Townsend*, churchwardens of Holy Trinity Church; Mr. *Jones*, residing in Colleton Crescent; and the nursemaid and cook in the family of the last-named gentleman, all deposed to having experienced nausea from the smell which they attributed to the gas-works.

Mr. *J. S. Perkins*, medical officer for the City of Exeter, said he had no doubt the smell came from the gas-works. It was like a smell caused by casting water upon burning coals, or like rotten eggs, or like the taste of Harrogate water. It was not like the smell that would come from the hide factories or tanneries in St. Thomas. The smell had at times driven him from his house, though it was not so bad where he lived as in other places. He had attended persons who complained of being rendered ill by the smell, which was like that from sulphuretted hydrogen gas.

Mr. *G. W. Stevenson*, civil engineer, of Westminster Chambers, said he had had considerable experience in the manufacture of gas. Some 12 years ago he was concerned for the promoters of an attempted new Gas Consumers Company in Exeter, and at that time considerable dissatisfaction was expressed with the existing state of things. The report which had been read from him he was prepared to uphold as a scientific man. The works were well situated for sending away the residual products. The ammoniacal liquor could be stored in underground tanks, and carried away in closed vessels by rail. There had been no general remodelling of the works. Every part of the gas-works should be in rotation, as he described. He found the gas-works at Exeter were defective. The retort-houses were not placed regularly, but were scattered about in different parts of the ground. The condensing apparatus was very insufficient in superficial area. It was less by one-half than what it ought to be. The principle upon which he acted was that for each 1000 feet of gas made per diem there should be 10 superficial feet of condensing surface. The maximum make of gas last winter was 800,000 feet of gas per day. Applying the principle given, it would require 8000 feet of condensing surface, the fact being that they had 3600 feet. With regard to the scrubbing apparatus, there were two scrubbers, each 10 feet high and 8 feet in diameter, and he should, for the same requirements and prospective increase, put up four scrubbers of 40 feet in height and 16 feet in diameter. The works must be made of a capacity to meet the heaviest demand made upon them in winter—exactly opposite to the requirements of a water-works, which would be calculated on the requirement of the heaviest day in summer. The effect of this deficiency in scrubbers would be to allow a large quantity of ammonia to pass into the purifiers with the gas, and so the lime or oxide, which, otherwise would be without stink, would stink enormously. This would account for the stink spoken of by Captain Thompson as arising from the lime. The scrubbers witness saw were very imperfect vessels, not gas-tight and he distinctly heard the fizzing of the gas as it escaped from the top of one of the scrubbers. All the scrubbers ought to be air-tight, in the interest of the company and the public. The effect of their not being air-tight would be to let into the atmosphere a crude gas charged with sulphuretted hydrogen. There were only one engine, one exhauster, and one boiler, that could be used, and only one set of exhausting apparatus was used during the winter. In works making only 20,000 feet a day duplicates were put in, but in this instance the company were making 800,000 cubic feet a day. The result would be a break-down in mid-winter when the pressure was heaviest, and the foul gas would pass into the atmosphere, and this would account for the smell which the witnesses had spoken of. Crude gas was as much like the smell of rotten eggs as one smell was like another. The pressure he spoke of would not have taken place if the company had had a self-acting bye-pass valve. Instead of that they had a screw-down valve, which required a person to go to it before it could be lifted. The valve being screwed down, the gas had to make an escape somewhere, and would force its way out in all directions. The purifying apparatus was very small for the work it had to do. He had described it as totally inadequate, and said so still. The purifying material required more frequent removal; the absence of that frequent removal caused a constant nuisance. If the purifiers were larger, the company could purify with oxide of iron, and prevent all nuisance. They could not now purify with oxide of iron because their apparatus was not large enough. The company suffered in increased charge, and the public in the nuisance, owing to this deficiency. The Corporation of Manchester purified the whole of their gas with oxide of iron instead of lime, and the same was done at Paris. The total storeage capacity at the Exeter works was 440,000 feet. One holder was 100,000 feet, one 300,000 feet, and four 10,000 feet. That was about half a day's consumption. The four old holders were leaky, and patched about all over, and the gas was fizzing about in all directions. The company would have saved by abolishing them years ago. The manager, no doubt, did all he could to prevent nuisance; but witness defied an angel to manage those works so as to prevent a smell. The escape of sulphuretted hydrogen on well-managed works would be impossible. From what witness saw at the works on the 8th of February, he should not be surprised to hear that there had been an escape of sulphuretted hydrogen. The piece of paper produced was a piece of blotting-paper which had been dipped in a solution of acetate of lead, and to produce such a discoloration as the paper then presented there must have been an escape of sulphuretted hydrogen. It ought not to be possible to obtain such a test as that in a gas-works, except by tapping a foul main.

Cross-examined by Mr. PITT-LEWIS, witness said he did not complain that the company employed lime in purification; he used it in his own practice. It could be so used without creating a nuisance. The favourable opinion expressed by Dr. Letheby some years ago upon the Exeter Gas-Works was not applicable to their present condition. The manufacture of gas at Exeter had doubled within the last seven years. Witness knew Dr. Redwood as an eminent man, but did not agree with the favourable opinion of the works he expressed in 1874. The opinion was that of a chemist, and not of an engineer. It was possible to make gas in the works without causing a nuisance, but there was a liability of a break-down. The works were fairly capable of making the summer make of gas, but were not equal to the maximum make in winter. He should take the summer make of gas at a trifle under 300,000 feet per day; it had increased largely of late. Witness's great complaint was that the company had not looked far enough ahead, and had starved and stinted the works. He was not aware that the company were spending £5000 on the works now; they ought to be doing it. He thought they should have spent £20,000, and should have made a little allowance for the future. He was not aware that £20,000 had been spent on the works within the last twelve years, but he thought that sum and a great deal more should have been expended.

Re-examined by Mr. BUCKNILL: He had stated that the company could produce their summer make of gas without nuisance. The scrubbers were not in a satisfactory condition, but they might be patched up for temporary use. The smell from boiling tar would not be like the smell that had been described by the witnesses. It would not be the smell of sulphuretted hydrogen.

Mr. *James Brown*, manufacturing chemist, Exeter, said that on the 13th of this month he went to Colleton Crescent, and smelt sulphuretted hydrogen. The wind was blowing from the works.

Mr. *B. C. Gidley*, town-clerk, produced the minute-book of the town council, showing that, on the 9th of May, the statutory certificate was received from ten inhabitants, and that on the 23rd of May it was referred to the Sanitary Committee to conduct the prosecution. On the 5th of July the Sanitary Committee ordered proceedings to be taken.

Cross-examined by Mr. PITT-LEWIS: There have been two sets of negotiations for the purchase of the works, one commenced in 1875, and one in 1877. The prosecution was not pressed during the negotiations, because it might be thought if it was pressed that the town council were seeking to depreciate the value of the works.

This was the case for the prosecution.

Mr. PITT-LEWIS addressed the Bench for the company, and submitted that no case had been made out against them. In the first place, the prosecutors had not proved the certificate. Secondly, the gas-works were not within the 114th section of the Public Health Act at all, and that upon the ground that there were a number of trades enumerated, concluding "or any other building or house for a trade causing effluvia." All the trades enumerated were connected with animal matter; this was a trade connected with mineral matter. The preceding section, 112, in which a similar list was given, concluding with the words, "or any other noxious trade," was much like the 114th section, and with reference to that section, it had been held by the Lord Chief Justice, and two other judges, that such a trade as brickmakers did not come within the section, and he submitted that the decision would apply to both sections. He further submitted that there was no evidence of any offence under the Act, and that the company were not a limited company, but had a special parliamentary authority to carry on their works, and the town council could only proceed against the company by showing that they had broken any of their conditions of existence. They had simply carried on the works which were made, and could not spend more than their capital.

The MAGISTRATES, without calling for a reply from Mr. Bucknill, overruled all the objections.

Mr. PITT-LEWIS, in opening the case for the defence, said that the company were actually at the present moment engaged in enlarging their works, not to meet any supposed nuisance, for if the nuisance existed it would incidentally have been remedied. The company, as such, were not guilty of causing the nuisance, but at the same time they found it was to their own interest to keep up with the times, and the contracts now in existence would get rid of everything Mr. Stevenson complained of—if he was right in his views. The town council seemed to have taken a somewhat strange course. They commenced negotiations with the company, and then broke off abruptly and took out the summons. They wanted to be aggressive, and to get hold of everything near them. He submitted it would have been better to have allowed the improvements to go on. He should tender in evidence certain reports which were made some years ago by some of the best scientific men of the day, who were brought down at a time when the council tried to get the works condemned, and he should show that the works were not then in such a good state as they were in now. [The learned counsel was proceeding to read from a report made by Dr. Letheby seven years ago, but it was objected to by the prosecution, and the Bench sustained the objection.] He contended that the smell complained of was more likely to arise from some of the factories in the neighbourhood, and that if the Court made an order they would not be able to tell the company what to do. He asked why it was that if a smell came from the gas-works, and was experienced in Colleton Crescent, they had no evidence of it being experienced in other directions? In conclusion, he submitted that the smell had not come from the gas-works, and said he should call practical men to prove that, and to dispute the view taken by Mr. Stevenson on the subject.

Mr. *R. P. Spice* said he was a civil engineer, practising in Westminster, and had had experience for over thirty years in connexion with gas-works. The report which had been handed in was made by him, and he still adhered to it. He had heard the evidence of Mr. Stevenson, and did not agree with him as to the smell which had been spoken of. On Monday witness was going to the gas-works, and experienced a smell which he recognized as the smell of tar, and thought it proceeded from the tar-works, near the gas-works. He knew the smell, because he had tar-distilling works of his own. He visited the gas-works in March, and on the previous day, and found nothing to account for a nuisance. On the previous day he looked over the fence into the tar-works, and noticed upon the chimney belonging to the gas company, abutting upon the tar-works, marks of

sulphurous compounds. There was no doubt that tar when highly heated, or when dealt with in an asphalte factory, would allow such matters to escape. He confidently believed that if the tar-works were removed to a distance, there would be an end of all complaint, because he believed that the tar-works caused the nuisance. He examined the chimney in the gas-works, but found no yellow coating such as had been seen on the chimney. On Monday afternoon he had the exhauster then in use suddenly stopped, and there was no smell perceptible, and no effect beyond the waste of gas. There were 35 retorts at work, and at the instant of the stoppage small flames appeared at the mouthpieces of some of them, and at the mouthpieces of others crude gas escaped, which, at witness's request, was lighted. Some plugs were taken out to show the gas, which had escaped out of the retorts, burning in the ovens. There was no repetition of the smell of the 16th of January, and could not be. In many small works exhausters were not used at all. If the exhausters were to be stopped, there would be a pressure of 6 inches in the retorts if there was a bye-pass valve, and there would be a waste of one-third of the gas made, decreasing until in a few hours it reached a normal loss of 10 per cent. Witness had gone carefully over the works, and found no cause for a nuisance. There would be an inconvenience in winter, arising from the restriction of certain parts of the apparatus. Sulphuretted hydrogen escaped sometimes; but to say that the smell arose from the gas-works was a fancy, a fallacy, and a delusion. It was impossible that it could have occurred. The scrubbers were not the leaky, patched-up scrubbers they had been described. He recognized the smell as that arising from the tar when it was being allowed to cool in the pits. It was like the smell of rotten eggs. He should say that the yellow on the gas-works chimney referred to was sulphate from the tar-works. He recognized from Mr. Stevenson's evidence that day that the gas had occasionally been passed through the lime purifiers before going through the oxide, which was the way that Mr. Stevenson wished it to be done. Witness handed in to the Bench a piece of lime which had been used in the way he suggested—the gas being passed through the lime first, and then through the oxide. Supposing the purifier to be impure, it would only smell when the purifier was being cleaned.

Cross-examined by Mr. BUCKNILL: I have seen the gas-works twice within the last six months, and found them being carried on properly. I maintain my opinion that the smell could not come from the works. I should be surprised to hear that the scrubbers are leaky, and had caused an escape of gas. Nothing ought to escape from gas-works. I found the scrubbing apparatus insufficient, and, a certain portion of the gas being insufficiently scrubbed, ammonia would pass along with it. I have recommended the company to double their purifying apparatus. The present purifiers are insufficient, and the holders are insufficient, but the condensing apparatus is not so bad. The "house" was not quite in "good order" when I went down to see the works. What I found on the chimney is, I think, a sulphurous deposit, but I took no means to test the correctness of that opinion. I am surprised to see the progress the gas company have made with the improvements I suggested. Sulphuretted hydrogen cannot escape from the works. It is childish to say it does so escape. I was informed that at the works they used the oxide first and lime afterwards in the purifiers. I suggested there were several points in which improvements could be effected, and they are being carried out in part. When an exhauster is used, and there is an accident, so that the valve cannot be opened, the gas would escape through the retorts and be burnt, and for the time there would be no gas made, and the city would be in darkness. When I wrote my report, I had no knowledge of the old holders having been used. The best way would have been for the company to have had them swept away long ago.

James Marks, a workman in the employ of the company, said that on the 16th of January, when there was a break-down of the exhauster, he unscrewed the bye-pass valve. It only took half a minute to do so. He had been at the works for many years, and had experienced no smell. Of a night he had looked over the wall into the tar yard, and there seen some blue vapour, from which there was a smell.

Mr. *J. T. Browning*, manager of the Plymouth Gas-Works, examined by Mr. PITT-LEWIS, said he had had large experience in the manufacture of gas, and knew the works of the Exeter Company very well. He corroborated the evidence of Mr. Spice, and expressed dissent from that of Mr. Stevenson in reference to the existence of a nuisance, on the exhauster ceasing to work. On the 16th of January last the company had no self-acting bye-pass valve at their works. He rather preferred a hand-moved valve.

Cross-examined by Mr. BUCKNILL: Under the old system of purification, by which "blue billy" was produced, the nuisance would have been ten times worse than under the present system. Gas-works could not be carried on without the escape of an infinitesimally small portion of sulphuretted hydrogen, but it would not extend beyond the walls of the works, in works so well conducted as those at Exeter.

Mr. *W. Stansfield*, resident engineer of the Exeter Gas Company, said he lived at the works, and had been there since January, 1876. During the last six months there had been nothing whatever on the works to cause a nuisance. In his judgment, the best practicable means had been used to prevent a nuisance. Alterations were in progress, not with the view of preventing a nuisance, but for improvements. The scrubbers were in the same state now as on the 16th of January, and he knew of no escape from them during the last six months. The lime purifiers were emptied once in three weeks or a month. The lime when removed was as white as the piece produced in Court, but it had been blue on one or two occasions when he had tried an experiment.

Cross-examined by Mr. BUCKNILL: At the last prosecution he said everything was all right, but a few days afterwards he found a tank on the top of a scrubber leaking and allowing a smell, which some persons might call a foul smell, to escape from the ammoniacal liquor. The ammoniacal tanks below were not quite closed as he had said they were. He had experienced no smell in the works, nor had any of the men whom he had asked from time to time.

By Mr. PITT-LEWIS: If there was an escape of sulphuretted hydrogen at the works it was to a very small extent. There was nothing on the works to cause the smell complained of. [Mr. Pitt-Lewis put in contracts for work going on now, and witness said the total amount was between £4000 and £5000.]

Several witnesses were called to prove that offensive smells had been experienced from other works in the locality, which might be the cause of the alleged nuisance, and that they had never themselves been annoyed with smells from the gas-works.

At the conclusion of the evidence the magistrates retired to consult, and, on their return into Court,

The CHAIRMAN said: We have come to the conclusion that the Gas Company are guilty of the charge against them in the summons, that of having a nuisance on their premises, and we fine them in the penalty of £5. Costs will follow.

On the application of Mr. PITT-LEWIS, the Bench fixed the sum of £200 as the amount to be deposited by the company, in the event of an appeal against their decision.

WANDSWORTH POLICE COURT.—THURSDAY, JULY 19.
(*Before Mr.* BRIDGE.)

DAMAGING GAS-MAINS.

Mr. *John King*, a contractor, living in Falcon Grove, Battersea, was summoned by the London Gaslight Company for injuring certain pipes belonging to them in Orkney Street, Culvert Road, and Sheepcote Lane, Battersea.

Mr. H. E. BROWN, in support of the summons, said the directors of the company felt it to be their duty to the public to take notice of the offence with which the defendant was charged. On the 30th ult. there was a serious escape of gas, and on the roads being opened the pipes were found broken. In one case a drain-pipe was covered over it, and in another a piece of pocket-handkerchief, the result being a serious escape of gas and an explosion. He asked the magistrate, under the 38th section of the Gas-Works Clauses Act, 1871, to impose such a penalty as would act as a caution to persons, in laying down drain-pipes, not to interfere with gas-mains.

Mr. *Edward Dawson*, of the "Royal Albert," Orkney Street, said the defendant's men had been at work opposite his house, cutting into the main sewer for the Board of Works. There was a very serious smell of gas both inside and outside his house. He saw the road opened, and a large hole cut in the main, and a piece of pot piping put over it. The company repaired the damage.

The *defendant* said he had no knowledge of the damage until he received an application to pay the cost. His man admitted putting his pick in the pipe, but omitted to give information to the foreman.

Mr. BRIDGE said the defendant was responsible for the acts of his workmen.

The *defendant* said he had paid for the damage, and had given strict orders not to cover up the pipes in future until he had seen them.

Mr. BRIDGE supposed the company would be satisfied with a small penalty.

Mr. BROWN said the company did not care about the money. All they cared for was the safety of the public. The idea of covering up a broken pipe with a piece of pocket-handkerchief was absurd. They could imagine the result, that which did happen—an explosion and destruction of property.

Mr. BRIDGE fined the defendant £1, and £1 1s. costs.

Mr. BROWN said damage to the amount of £20 had been caused, but that could be recovered in another Court.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

Major Bolton reports that the state of the water in the Thames and Lea was fairly good during the month of June. The water in the river Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was good during the month. The highest flood state of the river was 10 inches above the (6 feet) summer level, and the lowest was 2 inches below summer level. The highest temperature of the water taken at Seething Wells was 69°, and the lowest 56°, while the highest temperature of the air at the same place was 80° and the lowest 50°. The condition of the water in this part of the river was indifferent throughout the month. The highest flood state was 1 foot 6 inches above, and the lowest 2 inches above summer level. These observations were made daily at 9 a.m. The rainfall for the month was 2·85 inches. The filtered water supplied to the Metropolis, as shown by the June examinations, was good except in the case of the Southwark and Vauxhall Company, which supplied water ineffectually filtered. The deterioration of the waters of the Thames and Lea generally by sewage pollution continues, and points to the necessity of measures being adopted to prevent the contamination of these rivers and their tributaries (so long as they are the authorized sources of supply of the Metropolitan Water Companies) by the people living on the upper reaches, who now treat the tributary streams, as well as the rivers, as common sewers, both at their sources and during their course. It must also be borne in mind that the population of the country through which the Thames and Lea flow is reported to be rapidly increasing in density, thereby tending to establish centres of pollution for the metropolitan water supply. The works of the Southwark and Vauxhall Company generally are in a very unsatisfactory condition, and instructions have been issued by the Local Government Board, under sec. 35 of the Metropolis Water Act, 1871, for a special inquiry to be held, and a report made to them, upon the quality of the water furnished by this company.

EUROPEAN GAS COMPANY, LIMITED.

The Annual General Meeting of Shareholders was held at the Offices, 11, Austin Friars, London, on Wednesday, the 18th inst.—W. WHITE, Esq., in the chair.

The SECRETARY (Mr. H. Dozell) read the notice convening the meeting, and the report of the directors, as follows:—

To the returns of the six old stations are now added those of the Bolbec works, which did not come into the possession of the company until the 1st of September last. They show a profit which fully answers the expectations of the directors. At four stations the earnings have not proved equal to the amount of the previous year. This must be attributed, in a great measure, to stagnation of trade, which, although not experienced in France to the same extent as in this country, has nevertheless had a perceptible effect on the business of the company; the aggregate increase of rental at the six old stations during the twelve months being at the rate of 4 per cent. only, whereas in prosperous years, an addition of about 10 per cent. per annum may be expected.

At Boulogne and Nantes, where the additional profit is considerable, the increase of the consumption of gas renders extensions of the works indispensable, and land has recently been purchased in both those towns for the purpose of erecting new gasholders thereon.

A large saving has been effected in the cost of coals, but the unusual mildness of the past winter has had such an adverse influence on sales of coke, that prices had to be materially reduced, notwithstanding which large stocks remained on hand on the 31st of March, and these were valued at very low rates. The consequence is that the economy effected in purchase of coals has been, to a great extent, lost by lower returns from coke. This is especially the case at Amiens, Havre, and Rouen, where the whole of the advantage gained on the one hand has been exceeded by drawbacks on the other. Hence the less favourable returns from those three establishments.

The supply of coals for the present and next year has been secured on still further reduced terms. Should the value of coke advance during that time, the full effect of the improvement will be apparent in future accounts.

Summary.—The total net profits of the stations for the year ended the 31st of March, 1876, were £56,336 7s. 6d., and on the 31st of March last £60,235 13s. 10d., being an increase of £3889 6s. 4d. The amount of net revenue will admit of a dividend at the same rate as last year—viz., 10 per cent. per annum on the entire share capital of the company, less 4 per cent. paid (*ad interim*) on the 1st of February last; leaving a balance of £4288 0s. 4d. to be added to the reserve of undivided profits.

It will be seen from the accounts that, with the aid of a small sum from the reserve, the net profits would amount to 11 per cent. on the paid-up capital; but the board consider that, in the present political state of France, and the uncertainty of trade, it is not prudent to declare an increased dividend. They believe, however, that the prospects of the company are, on the whole, of a very encouraging character.

The board continue to renew or replace at 4½ per cent. the 5 per cent. debentures, which become due half yearly. The sum of £16,740, which matured on the 1st of the present month, has been so dealt with.

Notice has been given that two of your directors (Henry Solomon, Esq., and William White, Esq.), and both auditors (George Harrison, Esq., and Edward Garey, Esq.), retire from office at this meeting; but, being eligible, will be proposed for re-election.

The CHAIRMAN: Gentlemen, by the report which you have just heard read, you will have observed that our operations as a company now extend to seven stations. Formerly we had only six, but the results of the working of the Bolbec station now come into the accounts for the past year. I am happy to say that these results are such as fully to justify your directors in their determination to purchase the works, plant, and concession of that station. We have adopted some, and are going to adopt further measures to improve the working at Bolbec, and expect that, favourable as the returns have been during the past year, they will appear much better in the future. I remarked at the meeting last January that the great advantage of having several stations was, that in the event of adverse circumstances prevailing in one or two of them, they might be counterbalanced by the prosperity of the others. By the accounts now submitted to you, it appears that I was right in that remark, for, not including Bolbec, the additional profits made at Boulogne and Nantes during the past year more than compensate for the falling off at other stations, owing to causes entirely beyond the control of the directors—viz., general dulness of trade and the remarkable mildness of the winter through which we have passed. Under these circumstances the board have made the valuation of stocks as low as, or perhaps lower than, there is any prospect of seeing them fall to; otherwise the profits would have appeared larger. As the matter now stands, we are able to look to a further fall in the price of coke without anxiety; and if, as I hope, the next winter should prove more favourable for the sale of that product, you will have the full benefit in the next year's accounts, the supply of coal, as the report states, having been ensured upon very advantageous terms. Reviewing the position of the company, it appears evident that although the operations of the year have not been unchequered, still the results on the whole have been satisfactory. Few companies can do better than pay 10 per cent. upon a very largely increased capital, as ours has recently been, and carry forward a sum exceeding £4000. I think our prospects may be considered good. Our business is constantly increasing, though not at the same rate in every town we supply. When a decided revival of trade takes place, we may expect a further tide of prosperity to set in with us. There are indications—at least, I hope so—in this country, of trade improving, and that the long season of commercial depression is passing away; and if it be so in England, we may expect, also, the same in France, especially after the elections, which will take place before the commencement of the winter. I think I can, therefore, consistently congratulate you, as shareholders, upon the present position and future prospects of the company, and I trust we may confidently look forward to still increasing prosperity. With these observations, I move that the report be received and adopted, and when the motion has been seconded I shall be happy to answer any questions, and give you any further information or explanations that may be desired.

Mr. SOLOMON seconded the motion.

Mr. CURLING: Has the chairman anything to tell us about the electric light, which seems to have caused a very unnecessary panic the other day?

The CHAIRMAN: You seem to have answered yourself. I think it was an unnecessary panic. As far as we can gain any information to enable us to form a judgment, we have made up our minds that it is not a thing that can be commercially carried out. When I say commercially, I mean for the whole of the districts lighted by our company or any other. It certainly cannot be applied sufficiently to injure the property of the companies. Our colleague, Mr. Backler, who has read up the subject, and is acquainted with most of the experiments with the "electric candle," will be prepared to give you his ideas upon the subject before the meeting closes, if you desire it.

A SHAREHOLDER: I should like to ask the amount of the reserve-fund to which you now propose to add £4000, and what proportion it bears to the paid-up capital of the company.

The CHAIRMAN: You mean the amount of undivided profits. It is £34,850.

Mr. BADDELEY: The profits for the last half year are £34,000; we shall require £30,000 for dividends, and the balance of £4000 will be added to the reserve of undivided profits, bringing up the amount to £38,850.

The CHAIRMAN: As a question has been asked about the "electric candle," perhaps before the motion is put you would like to hear what Mr. Backler has to say on the subject.

Mr. H. M'L. BACKLER: In making a few remarks on lighting by electricity, I wish to state certain facts, from which you may draw your own conclusions, and determine, in your own minds whether it is likely that gas is, or will be, extinguished by the claims put forward in favour of the electric candle. It cannot be contested that this is a clever improvement on previous applications of electricity, and great credit is due to the Russian officer, M. Jablochkoff, to whom we are indebted for this so-called candle. It is undoubtedly an interesting experiment, most attractive to scientific men. Let us see how far it is practical. M. Jablochkoff and his associates state that they have discovered the means of dividing an electric current so as to supply 50 lights from one generator; but, in effect, they have not succeeded, to my knowledge, in supplying publicly more than eight; that is, therefore, the number we have to deal with. Another system, that of M. Lontin, is now being tried in Paris, to supply separately 24 double lights from one source of electricity; but that is not, at present, much more than a scientific experiment, which may or may not succeed. M. Jablochkoff requires (to supply a number of lights not exceeding eight) an electrical machine, or primary producer of the electric current, and this is set in revolution by an engine of six-horse power, more or less. From this magneto-electric, or electro-magnetic machine—for it is called by both names—the wire is led to the points where the candles are fitted up. These candles consist of two parallel vertical carbon pencils or sticks, about 4 inches long, with a strip of an insulating compound, called kaolin, between them. In the first experiments the sticks or wires were surrounded by kaolin, in the form of a candle; hence the name. I should mention that real kaolin is a species of hard clay, employed in porcelain manufacture. The compound is fusible at a high temperature, and is, or should be, consumed at the same rate as the carbon points. I may say, in passing, that as it becomes volatilized, particles of silex are liberated, which have an irritating effect on the eyes and respiratory organs. When the electric current is established (the positive and negative points being connected by means of a small cross-piece of graphite), a bright light is produced, and the carbon pencils and strip of kaolin all burn away together, unless the fused kaolin gutters over the carbon, which occasionally happens. In that case the electric current is interrupted, and the light goes out. These carbon sticks are consumed in about half an hour, and must then be renewed. Whilst this is being done, the light ceases, unless a duplicate candle, previously lighted and kept in readiness, serve as a substitute. At all events, very delicate manipulation is required every half-hour. It is alleged that one of these candles emits a light equal to 100 gas-burners, but in this M. Jablochkoff presents us with a sort of white elephant, for, generally, we do not require the 100 lights for which he expects us to pay. In this room, for instance, there are seven gas-burners, and they are sufficient for our purpose. In the next room there are only three. Now, here we should have to pay for 93 more burners, and there for 97 more than we require; or, comparing light with light, for efficient use, we ought to get the electric candle in this room for 1-14th of the price of the like illuminating power from gas, and in that room for 1-33rd. In effect, however, we should not get much more light, because we should have to do what M. Jablochkoff and his associates do—that is, intercept by thickly-painted or double-ground glass globes the superabundant brilliancy, which would be intolerable to the eyes in confined spaces. If the comparison be correct as regards these offices, it must also be accurate as regards dwelling-houses, shops, and even roads and streets, where the requirement is not a strong light in one place, but diffused lighting, spread as equally as possible over the entire space to be illuminated. This cannot be better effected than by means of gas. Probably it will be stated that the power of the electric lights may be reduced considerably, if desired; but we must pay the expense of inducing an electric current, and dividing it, whether we utilize it fully or not. Perhaps the advocates of the electric candle will say also that its cost does not exceed 1-33rd, light for light, that of gas in ordinary use, and perhaps they may say even 1-100th, to meet the case of a single gas-burner. In fact, I have heard it stated that it is immeasurably cheaper; but, when I came to inquire further, I found that the proprietor of the establishment where the electric light was used was supplied gratis by the promoters, to induce him to consent to the trial. Certainly gas could not compete on such terms. But admitting, for the sake of argument, that, where we have to pay 20s. for gas, we should not have to pay more than £1 for electric lights, still we could not dispense with an electro-magnetic machine, and a steam-engine, with boiler, somewhere on our premises, or in one house out of every two or three. We should have to find a place for them, and to provide a man, who must be a stoker, to work them. This man would have to take charge of the whole apparatus, and must keep running over the house, every half hour or so, to change the carbon sticks. This would be the case not only in our shops and warehouses, but in our dining-rooms, libraries, drawing-rooms, and bed-rooms—in fact, wherever artificial light is used. How such an addition to our domestic establishments (not very easily managed as it is) would be viewed by the ladies who preside over them, I can more readily imagine than describe. Besides which, as we require artificial light for a few hours only every day, the machine and engine would have to remain idle the greater part of the 24 hours, and we should have to get the steam up daily, towards evening; but, in case of a sudden fog, time would fail, and we should have to fall back on wax or tallow candles. Our stoker would have an easy life of it, and ample leisure to flirt with any of the female servants who might be so disposed, and I fear this electric spark would prove rather troublesome than otherwise. Now, if I leave this office, or any of my own rooms, unoccupied for a short time, I turn down the gas to an almost imperceptible jet, and the consumption nearly ceases until I turn it up again, without even taking the trouble to strike a match. If I want a night-light in my bed-room, a very small jet of gas answers the purpose. If I am an early riser, before the servants are moving, I turn a gas-tap, and in a few minutes my hot water is ready, and my dressing-room may be made warm and comfortable on the coldest winter's morning. I may have all my meals cooked by gas, and my bath-room may be made ready at short notice, by the same means. Will the electric candle enable me to do all this? Certainly not! Monsieur Hippolyte Fontaine, an eminent French electrician, and the author of an important work on lighting by electricity, says that he has never so much admired the facility of employment, the simplicity of fitting up, the indefinite divisibility, and the multiplication of the uses of gas, as since he has been occupied with the subject of lighting by electricity. M. Servier, the talented President of the French Technical Gas Society, thinks that a wide field is still open for the extension of gas lighting in France, and that great facilities should be afforded to render it available everywhere, and to every one. Customers would thus be secured in quarters where the electric light can never even pretend to compete. Possibly the electric light may be advantageously used for lighthouses, lofty factories, and halls, especially where some motive power is in action for other purposes, and has merely to be transmitted, by means of a driving-band, to the magneto-electric machine. It is, however, questionable whether this can be done economically, except in rare cases. A high French authority estimates that the cost of the electric lights at the Magasins du Louvre, in Paris, is four times that of the quantity of gas which would be sufficient. In the establishment of M. Pouyer-Quertier, near Rouen (which was prominently quoted, in the leading article of a daily London newspaper, as an instance of the perfect success of the electric light), that mode of lighting has been discontinued for the last 12 months. The electric light apparatus, mentioned in the same article as fitted up in the large luggage-hall of the Northern Railway Station, in Paris, was also given up, after an experiment which, as I myself gathered from the officials, was unsatisfactory to them in the performance of their duties, inasmuch as the light was found to be a flickering and unsteady one. In a large workshop at Havre, where an electric light apparatus has been fitted up, at a cost of about £500, it merely illuminates the central part of the establishment, whilst workmen employed at the extremities, along the walls, continue to use gas. At the West India Docks, in London, the first trial had to be given up, owing to defects in part of the apparatus, and the second experiment was of very short duration; the inconvenience and disadvantage of changing the carbon sticks being thus skilfully avoided. Now that I have laid the principal facts before you, I leave you to draw your own inferences. Those who are afraid of the electric light will, of course, dispose of their gas shares. No one will sympathize with them, for they will get an excellent price from the purchasers. But, to act consistently, the proceeds should be reserved for investment in some of the electric light companies, which will certainly crop up shortly, and to which leading articles in daily papers, and Stock Exchange panics, are but the prelude. All I can say is, that those who adopt that course are very likely to regret it. I have seen many schemes come on and go off—peat gas, water gas, oil gas, patent gas, Eupion gas—all gone; some of their promoters safely lodged, at the expense of the Government, and others would receive similar hospitality if they had their deserts. For my part, I intend to stand by European gas, which is quite strong enough for me.

The motion for the adoption of the report was then put and carried.

The CHAIRMAN moved—"That a dividend at the rate of 10 per cent. per annum be declared on all the shares of the company, according to the amount paid thereon, and an interim dividend, at the rate of 4 per cent. for the first half year having been paid on the 1st of February last, that the balance, at the rate of 6 per cent., for the second half year, be paid on the 1st of August next; the whole out of interest and profits, and free of income-tax."

Mr. SOLOMON seconded the motion, which was put and carried.

The CHAIRMAN moved, and Mr. E. F. WHITE seconded, the re-election of Mr. Solomon as a director. The motion was carried.

Mr. SOLOMON, in returning thanks, said: I have much pleasure in acknowledging your kindness in my re-election. The board have worked together most harmoniously to the present time, and I believe that, under

the careful management of the directors, assisted by the large experience of our friend Mr. Backler, there is a great future before the company.

Mr. CHALONER SMITH: I have great pleasure in moving the re-election of our respected chairman, who is one of the retiring directors on this occasion. I believe every one present knows the long connexion of Mr. White with, and the services he has rendered to, this company; but perhaps you do not all know that those service were rendered at a time, when our position and prospects were very different to what they now are. I am sure it must be most satisfactory to him to see the fruit of those services, and to find that, after his long connexion with this undertaking, we are in a state of growing prosperity equal to that of any other gas company in this or any other country.

The motion having been seconded, was put and carried.

The CHAIRMAN: Gentlemen, it is very pleasurable to me to receive the expression of your kind approbation on this occasion. I happened to be looking through some of my papers to-day, and I find that on June 14, 1848, I received a requisition in these terms: "We, the undersigned shareholders of the European Gas Company do request that you will consent to be put in nomination for a director of that company, the election of which will take place at the next annual meeting in July." My answer to that requisition was this: "I have received your requisition, numerously signed, and I hereby declare myself a candidate for the office, and should it please you to elect me, I assure you I will pay that attention to your affairs which I fear they very much need." From that day to this I have carried out my promise to the shareholders. At that time the shareholders were receiving no dividend. Since then the dividends have been paid regularly, and I do not think the shareholders have reason to complain of anything. Again thanking you for this mark of your confidence, I will now ask you to propose the re-election of Mr. G. Harrison as an auditor of this company.

Mr. STOKES moved the re-election of Mr. Garey as an auditor.

Mr. LIVESEY said he had great pleasure in seconding the motion, but he thought a few words of explanation were necessary. Mr. Garey was expected by many shareholders to have had a seat at the board by this time, and it was right the shareholders at large should know why he had not attained it. When the last election took place, the directors acted perfectly fairly, but unfortunately the scrutiny took place in public. It appeared that Mr. Garey obtained 17,000 votes, Mr. Baddeley 14,000, and Mr. Harrison 12,000. Mr. Harrison handed over his 12,000 to Mr. Baddeley, thus making his number up to 26,000, and he was therefore declared elected. Now, he (Mr. Livesey) thought this was not what the shareholders intended. He did not make any complaint; everything, it was said, was fair in war; still, it appeared to him that the real majority of votes was in favour of Mr. Garey, and it was right that those who did vote for him should know that he was not in such a hopeless minority as the numbers declared seemed to show. He (Mr. Livesey) did not wish to say a word to create any ill feeling, and the remarks he had made were entirely against the wish of Mr. Garey.

Mr. LOVEJOY expressed regret that the matter had been brought forward. It was now an old affair, and had better be left alone, as it had nothing to do with the business of this meeting; and if it were gone into, he could put a very different complexion on the matter.

The CHAIRMAN said he was himself as much taken by surprise as any one by the proceedings at the meeting referred to, and should not like to have been placed either in Mr. Garey's position or in that of the gentleman who was elected a director. But it was better now to "let bygones be bygones."

The motion was put and carried.

Mr. GAREY, in returning thanks, said it was against his wish that Mr. Livesey mentioned anything about the election, although he was anxious that those who voted for him should know that he really had a majority of votes given to him. He renewed his most sincere thanks to those shareholders who supported him on the occasion, and thanked Mr. Livesey at least for his kind intentions.

Mr. HARRISON acknowledged his re-election. He said the auditors of this company were much indebted to the gentlemen in the office for the very complete and perfect manner in which the accounts were presented to them, which rendered the inspection of the books a pleasant duty. In reference to Mr. Livesey's remarks, he considered that, in taking the action he did, he carried out the intentions of the majority of the shareholders, which ought to be respected. He and Mr. Baddeley entered the room on the day of the election in advance of Mr. Garey by 2000 votes. Two or three gentlemen then present gave 6000 or 7000 votes to Mr. Garey, thus placing him first, and it appeared to him (Mr. Harrison) that this would have defeated the main object of the shareholders.

Mr. BEARD expressed a hope that the interesting statement made by Mr. Backler would find its way into the newspapers. Considering how many widows and orphans were affected by the diminution in the value of gas property, he thought it was a public duty to caution them against a panic such as had recently taken place.

The CHAIRMAN said the statement would, no doubt, appear in the report of the meeting.

Mr. STOKES moved a vote of thanks to the chairman and directors, and said he thought the meeting was greatly indebted to Mr. Backler for the lucid statement he had made in reference to the question of the electric light.

Mr. LIVESEY seconded the motion. With respect to the "electric candle," he did not believe that any one connected with gas companies would be believed, whatever he said on the subject. The moral that he drew from recent events was this, that it was the duty of gas men to exert themselves to the utmost to show the great advantages of gas, and how it might be applied in all circumstances, its great convenience for heating as well as lighting. If they resolved upon this, the late "scare" would have done more good than harm.

The resolution was cordially adopted.

The CHAIRMAN acknowledged the vote. He could candidly say that, as a board of directors, they did their best in every possible way to protect and advance the interests of the shareholders, and it was a great consolation to see the affairs of the company so prosperous.

The proceedings then terminated.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Sixteenth Annual General Meeting of the Members of this Association was held on the 13th inst., in the Union Hall, Stirling. Mr. ADAM MACPHERSON, President of the Association, occupied the chair.

The SECRETARY (Mr. William Mackenzie, Dunfermline) read the minutes of the last annual meeting, and also those of various committee meetings held during the year, which were approved of. He also read the report by the committee on the competing papers for the prize offered by Mr. Andrew Stewart, Glasgow, on the subject—"Is it Possible to do without the Aid of Gasholders in the Production and Supply of Coal Gas, and what Practical Means can be Suggested to Serve the same Purpose." The report stated that while the papers submitted showed much careful study of the subject, yet the committee did not feel justified in making any award upon them.

Mr. A. Donaldson and Mr. J. Watson were appointed scrutineers of the ballot-papers for the election of office-bearers.

NEW MEMBERS.

The following gentlemen were admitted members of the Association—viz.:

ORDINARY MEMBERS.

Cowie, Robert	Gas-Works,	Callander.
Dalzell, Thomas A.	,,	Austruther.
Harper, David	,,	Dysart.
Millar, William	,,	Dundee.
Scott, Frank	,,	Tillicoultry.

EXTRA-ORDINARY MEMBERS.

Aitkin, Henry	Coalmaster, Falkirk.
Hurll, John	Retort Maker, Glenboig.
Laidlaw, Robert	Engineer, Glasgow.
Mackay, Alexander	Meter Maker, Edinburgh.
Ross, James	Manufacturing Chemist, Falkirk.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—In accordance with the practice of those who have preceded me in the office of President, I purpose to address you briefly on a few subjects which I consider of general interest to the members of this Association. At the same time, I do not intend to encroach much on the time at your disposal, which I consider to be far too limited to justify me in occupying any considerable portion thereof, and which I am certain will be spent to greater profit in listening to the papers to be contributed by various gentlemen, and the discussions thereon.

Before, however, proceeding further, I would desire to tender you my most sincere thanks for the honourable position you assigned to me at your last annual meeting, in selecting me for President of this Association—a position (however sensible I am of my inability to do justice to it) I have been very much pleased to occupy when called upon by you to do so; and in the full assurance of your kind consideration of my failings and shortcomings, I have endeavoured to discharge the duties to the best of my ability, and I trust not altogether unacceptably to you. I can assure you I shall endeavour to discharge the duties of my office to-day in such a manner as will promote your comfort and the interests of the Association; and I hope the discussions which follow the reading of the different papers will be conducted with your usual kindliness of feeling, and that while nothing shall be left undone to elicit the fullest amount of information on every subject that may be discussed, all will be done with a just and considerate moderation.

I very much regret, and I am sure you all join me in this, the absence at this time of one to whom this Association is deeply indebted for services rendered to it for a long period of years. I refer to the late Mr. William Fraser, of Inverkeithing, our auditor, and one of our oldest extra-ordinary members. Mr. Fraser, although not a gas engineer or manager, took a lively interest in everything connected with the profession, and had a thorough knowledge of almost everything connected therewith, and in many ways endeavoured to promote the interests of this and kindred Associations. In our discussions he took a considerable share, and by his perspicuity he helped in no small degree to make plain and lucid the sometimes intricate details of a subject; while his genial nature, the urbanity of his manner, and his upright, consistent character gained him our respect and esteem, and endeared him to us all. In Mr. Fraser this Association has indeed lost one of its strongest and most ardent supporters.

Since our last annual meeting the committee have carried into effect the remit you then made to them, and have presented Dr. S. Macadam with a silver epergne, bearing a suitable inscription, in acknowledgment of the valuable services rendered by him to us. In instructing your committee to do this, I consider you have done nothing more than discharged a duty which was most incumbent upon you—a duty of which, I am sure, we were all deeply sensible, and which it has given us all great pleasure to perform. Dr. Macadam is a gentleman who has given us unmistakeable evidence of the interest he takes in our Association, by his willingness at all times to do whatever is in his power to contribute to the welfare thereof; while the free manner in which he has communicated to us the results of his valuable experiments, on all matters relating to gas manufacture or combustion and other important subjects, has put us under deep obligations to him, not only as an Association, but personally. And in thus acknowledging his services, and showing him that you appreciate and respect and esteem him as he deserves, I repeat you have only discharged a duty.

I have to-day to congratulate you on the continued prosperity of the Association. Our membership steadily increases, but still there must be a very large number of managers of gas-works who are not members. This I cannot think can be owing to their not appreciating the benefits to be derived from the meetings and transactions of the Association, as it must be evident, to all who are acquainted with the objects we aim at, that a great amount of benefit must accrue to those who attend our meetings, and either contribute papers, take part in the discussions on the various subjects brought before the meetings, or only listen to the papers and discussions, as it is here that all matters affecting the interests of gas companies are discussed and duly weighed; where all or nearly all new inventions of all kinds of apparatus required in the manufacture and distribution of gas are brought forward for exhibition, and their action fully described, and all necessary information given, so that the members may be enabled to consider and deliberate upon the advantages or otherwise to be derived from their adoption; where new processes, intended to cheapen the production of gas, or to improve its quality, are explained, and, as far as possible, the methods of working exhibited; where, in fact, everything calculated to advance the interests of gas companies or corporations is submitted to a thorough and exhaustive inquiry, and their merits or demerits fully, freely, and fearlessly pointed out and commented upon; where all knotty or difficult questions connected with the profession generally are brought forward for discussion and solution, and at which any one, who has doubts about any operations he may contemplate, may have the advice and experience of the entire membership to assist him in arriving at a proper conclusion, and this, no doubt, may often be the means of effecting considerable savings to gas companies or corporations.

If we look over the past transactions of the Association, and note the number of subjects which have been brought before our meetings for consideration and discussion, and the great amount of information thereby elicited, it must be plain to the mind of every manager that it would be a great benefit to him to become a member of such an Association, and not only to become a member, but to regularly attend the meetings. I cannot, therefore, attribute as a reason for those who are not members, or who, although members, do not attend the meetings, a want of appreciation of the benefits to be derived, and which would enable them to discharge their duties in a more efficient manner, and so confer a benefit on their respective companies or corporations, and, consequently, on the gas consumers at large. What, then, can be the reason why such a considerable number of managers are not members, and that the attendance of members is not always what might be expected and desired. Can it be that

they are callous and indifferent to their own interests and those of the companies or corporations they represent? I most emphatically say that such is not the case; for, in all my experience of managers of gas-works, I must say I never yet met one who did not take a lively interest in the welfare of the undertaking committed to his charge; in fact, I am inclined to consider as one of their distinguishing characteristics, their deep anxiety for the prosperity and success of the works under their management. I am, however, fully persuaded that the cause is not difficult to find, and in my opinion rests not with the managers, but with directors of gas companies and gas committees of corporations, in not providing their managers with the necessary funds to enable them to attend the meetings. I may say all, or nearly all, the managers of the larger-sized works in Scotland are members, and attend our meetings regularly. The salaries paid to these gentlemen permit them to do so without inflicting any injustice on themselves or families. We have also amongst our members many managers of small works, who are most assiduous in their attendance, and this doubtless at considerable pecuniary sacrifice on their parts, which clearly shows that our Association is appreciated, and the privileges gladly taken advantage of, not only by those who can afford to do so without any personal sacrifice, but that a considerable number so highly value them that to participate in them they willingly make a sacrifice. Although this is highly commendable on their part, I do not think they are entitled to do so, as, seeing all the pecuniary advantages are reaped by the gas companies or corporations, they, in my opinion, are the proper parties to bear the necessary expenses, which, although considerable to a private person, who may be very unable to spare it, by the inadequacy of his salary to do more than meet the wants of his family, would never be felt by even the smallest gas company. I feel convinced, if this were properly represented to the different companies and corporations, they would not only cheerfully allow their manager such a sum as would be adequate to permit of them becoming members, and defraying the expenses incurred in their attendance, but would show their anxiety for regular attendance at our annual meetings; and I am sure there is no manager but who is justly entitled to such a pleasant and profitable relaxation from his arduous duties. Few people, and not even directors of gas companies or corporations, have any idea of the great amount of trouble, thought, and constant anxious care which falls to the lot of the managers of gas-works, and as few ever consider or imagine how dependent they are on this constant watchfulness for the uninterrupted supply of this article of daily use, and the supply of which, I am convinced all gas consumers will acknowledge, forms one of their chief comforts on many a cheerless stormy night, and which they use without for a moment supposing they may be deprived of it. So much for their confidence in the ability and care of the manager. But while, with all due care and attention on the part of those in charge of other large manufacturing concerns, we have an occasional breakdown and stoppage of work for a few days, one seldom or never hears of a town wanting its light through some breakdown at the gas-works, and this is not because we are exempted from such liability to accident—for I believe we are as liable as, if not more so than any other class of works to such accidents—but managers know the grave responsibility resting upon them, and by constant care and attention, by day and night, and too often even without the relaxation of the Sabbath, enjoyed by almost every other class of business men, generally manage to pilot the works entrusted to their care through the long dark winter successfully. But I repeat, few people imagine the great amount of vigilance, and the wear and tear of body and mind that this often entails, and surely it ill becomes any gas company or corporation to begrudge their manager such an annual allowance as would enable him, by his attendance at our meetings, to acquire a knowledge of all that is calculated to lessen his anxious labours, and which knowledge would, at the same time, prove profitable to themselves; as, doubtless, not only by the papers read, and the discussions which take place, would their manager profit, but by the free and friendly intercourse he then enjoys with his professional brethren, he is enabled to acquire an accurate knowledge of what each individual is doing to lessen labour, or improve the method of manufacture or apparatus employed therein, and thus obtains many a useful hint regarding many matters, in themselves perhaps small, but in the aggregate important.

Managers of works situated in remote and often ill-to-get-at places, should, I consider, especially endeavour to avail themselves of the benefits offered by our meetings; as, from their isolated position, they have fewer opportunities of becoming acquainted with all the most improved methods and latest improvements, being in a great degree precluded, by the sometimes very considerable distance which intervenes between them and their neighbouring managers, from that friendly intercourse which usually takes place amongst those situated in more densely populated parts of the country, and which is a great improvement on what was customary only a few years ago, when every one had his own system of conducting operations (which he conducted in the most secret manner possible), and when the conservative element was so strong that, instead of being a benefit and assistance to each other, and to the profession generally, each one looked on his neighbours with a jealous eye, and concealed all he could from them; and it is no doubt owing to the formation of this and kindred Associations that this barrier of professional jealousy has been broken down, and the present happy time has arrived, when all vie in their endeavours to assist in any way their neighbours.

Before I leave this subject, I would recommend all managers—those in charge of large works as well as small, as in this way they may be of service to others—to bring this matter before their respective committees, and urge upon them the expediency of an annual allowance being granted for this purpose; and if this was successfully carried out, the usefulness of the Association might be greatly extended, and instead of one day for transacting all our business, we could easily have two days, which is quite short enough time for the business we have to do. I am sure all of you who were present at our last annual meeting in Edinburgh must have greatly regretted the hurried manner in which the valuable papers contributed by various gentlemen had to be curtailed and pushed through; and, at the same time, this was the cause of much valuable discussion, from which we were entitled to anticipate valuable information, being stifled. Besides this it must be very annoying and disheartening to those who have carefully compiled their experience on certain subjects to see them passed over with so little notice; not, however, from any want of appreciation or anxiety to do them justice on the part of the members, but simply from want of time. Thus the desirability of extending our meeting to two days I think is a subject worthy the consideration of the Association.

The amount of legislation relating to gas supply during the past year has not been so great or so oppressive as during some previous sessions, the infliction of the auction clauses being the new rod applied to all companies asking incorporation or extended powers. No doubt this is unfair and oppressive to many shareholders who, in purchasing shares, have discounted the probability of the issue of new shares at par. In Scotland, however, I believe a considerable number of companies do voluntarily expose their new shares to sale by auction, so as to include in their list of shareholders as many consumers as possible, hoping thus to strengthen the company by having the interest in it as widespread as possible; and some Scotch companies, for the same reason, prohibit the sale of their shares to any one not a consumer of the company's gas. I suppose there is little or no hope of redress for those whose interests are prejudicially affected by this last new infliction, although why gas companies should be so dealt with, and have often great hardships thrust upon them, while other trading concerns are allowed to manage their own business without continual legislative interference, is a mystery to most people.

The Burghs (Scotland) Gas Supply Bill was a measure, according to its promoters and supporters, most urgently required for the protection of poor oppressed gas consumers from the tyranny of gas companies, and one would have expected that by this time there would have scarcely remained a gas company in Scotland, but that all of them would have been put out of existence and absorbed by their respective corporations; but what is the result? Only, I think, some three or four towns have shown any sign of availing themselves of the powers therein contained, which is, I think, significant, and goes a long way to prove that most of the companies have conducted their operations in such a manner as to merit the confidence of their consumers, and I have no doubt, conducted as most of our companies are, it is for the consumers benefit that the supply should remain in their hands.

Most of you will have noticed the fate of the Bill by which the Chartered Company attempted to get some less stringent enactment regarding the amount of sulphur in the gas supplied by them. This is a question on which a great amount of time and money has been expended without any very satisfactory result. The company are compelled to spend large amounts on apparatus, &c., to enable them to comply with the regulations restricting the amount of sulphur in the gas, and although they may thus be able to keep down to, or within the quantity allowed, I am sure you will all agree with me in saying the benefits thus derived are so small, that the expenditure of money requisite to obtain them is not justified. I am inclined to think these regulations will soon be considerably modified, as those in force at present merely raise the price to the consumers, without conferring on them benefits adequate to compensate them for the higher price. I by no means intend it to be understood that I consider an unlimited amount of sulphur would not be prejudicial, but if a company were allowed a reasonable limit, it would be found they would not abuse the privilege.

Do the advocates of an 18 or 20 candle gas for Scotland take into account this question of sulphur? True, we at present have no complaints on this head, but if the standard quality were reduced to 18 candles, and the poorer classes of coal used, it is quite possible we might then hear something of it. The limited quantity of gas used, where rich cannel gas is supplied, tends, in a considerable degree, to prevent the complaints so often heard of the vitiation of the atmosphere of rooms, offices, and public halls, where 16 to 18 candle gas is used, and this is an important point, when considering the propriety of introducting 18 to 20 candle gas as the standard for Scotland. One of the chief points urged in favour of such a supply is that, with the burners at present in use, the minimum of light is obtained from the rich gas; but surely this is no reason for condemning it, because, by so consuming it, it is not used but abused, and if people are so indifferent to their own interests as to purchase burners without making inquiry regarding their adaptation for the purpose for which they are intended, they are certainly guilty of great carelessness, not usually exhibited by them when making purchases of the other articles they require in daily life. But why should not the gas companies obtain and supply a burner suitable for the quality of gas sent out to their consumers? Besides this question of different results, with different burners and the same gas, is not peculiar to Scotland, almost as variable results being obtained by the different kinds of burners in use in England with the quality of gas recommended for our adoption. So while a suitable burner is of considerable importance in obtaining the full value of the gas consumed, it is also certain that the pressure is of as much, if not greater, importance, and if large burners are used with a low pressure, the greatest possible value in illumination will be obtained. But apart altogether from the question of burners, very few companies are in a position to adopt the suggestion, as this would necessarily entail a large addition to the manufacturing plant, enlarged mains for distribution, and increased storeage accommodation; larger meters and fittings would also be required. I am under the impression that most gas-works have only too little means of meeting the gradual increase of consumption at present going on, through the natural increase of the population of the towns or districts supplied by them; and could you expect these places to go in for such an increase as would be necessary in the plant, &c., which I estimate, at the lowest figure, would be 25 to 30 per cent.? In fact, from the position of many of these works, surrounded and hemmed in as they are on all sides, such an extension would be almost impossible. It would also be a hard task to reconcile consumers to the expense of altering and enlarging all their fittings; and, looking at the subject in all its bearings, I have no hesitation in saying the proposal will never find favour among our consumers, so long accustomed as they have been to the high quality. The time may come when they will be compelled by circumstances to submit to the change: until then, I fear an attempt to introduce such a standard would certainly fail.

During the past winter, in a letter to the JOURNAL OF GAS LIGHTING, by one who, I believe, is a member of our Association, attention was drawn to a subject which I think deserves consideration. I refer to the method at present adopted by analysts and others, when testing the illuminating power of gas as supplied to towns, of correcting the results obtained to what is termed the standard temperature and pressure. Although this may be right and necessary where the test is for comparative purposes—such as testing the results obtained by different processes of manufacture, or for ascertaining the comparative values of different coals—I consider it, when applied to an ordinary test, for ascertaining the illuminating power of the gas at the time being supplied to consumers, as indefensible and unreasonable. Why, what is the meaning of the test? It is to find out the amount of illuminating power possessed by 5 cubic feet of gas, as compared with 120 grains of sperm. For this purpose a meter is used for measuring the quantity supplied to the jet of the photometer; and one would reasonably suppose that the consumption shown by it would be accepted as the quantity consumed during the test, but this is not so. The consumption, as registered, is noted, and then you find that 100 cubic feet, as registered, is not 100 cubic feet for this purpose, unless it happens that the temperature is 60° Fahr., and the pressure 30 inches; but should the temperature be, say, 36° Fahr., and the pressure 30 inches, 100 cubic feet will then be reckoned equal to 105 cubic feet, and a corresponding deduction will be made in the illuminating power; and, while this is given as the correct value in illuminating power, the gas company or corporation are only paid for 100 cubic feet by all using gas, instead of 105 feet, as it is declared by this method to be. Surely, if it is fair to calculate 100 feet, as actually registered, as 105 feet for the purpose of the test, it is also fair to pay for that amount, or disregard these varying conditions of the atmosphere, and give the illuminating power of 5 feet, as ascertained by the measurement at the time of the test, as the true value, as it really is to the consumer.

It is unnecessary for me to occupy your time in enumerating all the improvements in apparatus, &c., which have been brought forward during

the past year; but I may be excused if I refer to a few things of perhaps more than ordinary importance. And, first, I would desire to draw your attention to a process which will have occupied the attention of most of you. I refer to the Aitken and Young process. The increasing demand for the really first-class cannel coals is having the effect of raising the price of them year by year, and, although we are not altogether dependent on them for the maintenance of our high illuminating power, any process which promises to enable us to maintain it at less cost than at present must be specially interesting.

All of you will have studied with the closest attention the report by the committee of the West of Scotland Association, who were appointed to inquire into and test this process, and I am sure you will all agree with me when I say we are greatly indebted to them for their carefully prepared report. It is, however, I think, a pity they could not have carried out their comparison of the results of the old and new processes a little further, and, after taking into account the cost of generating the steam required for volatilizing the naphthas, and the deterioration of the tar caused by depriving it of the naphthas, and any other expense necessary to be taken into account to allow of a just comparison between the new and ordinary methods, have stated the cost of producing 100 lbs. of sperm value by each. I have no wish to anticipate Mr. Mitchell's paper by any remarks I may make, but I cannot refrain from making a few, and, without passing any opinion for or against, I would refer to a few points which are important in judging the merits and demerits of the process. It has been asserted that, by depriving the tar of its naphtha, the value of the tar is not reduced. Well, I consider this questionable; and certainly, to those companies or corporations who possess chemical works of their own, it would be a consideration, as, after extracting the naphtha from the tar produced from the manufacture by the ordinary process, they would still have the boiled tar to dispose of, and for this I would say they would get as good a price as is obtained for the boiled tar produced by the Aitken and Young process; so that the position with them would be the value of boiled tar and extra illuminating value of gas, as against value of boiled tar and value of naphtha obtained. Then question, does the extra illuminating power obtained exceed the value of the naphtha? I have not myself been able to inspect the process as carried out at Hamilton, but I am informed the carbonization is carried on at a low temperature, by which some saving may be effected in the wear and tear of retorts; but was the coal carbonized by the ordinary method also treated at this low temperature, or was the temperature of the retorts raised to the degree usually employed for the ordinary process before the comparison was made? This is a point of importance, as, although a low temperature may be that best suited for the new process, it is well known that by too low a temperature the full value is not obtained by the ordinary process. These, and many other considerations, must be duly weighed before a just comparison can be made. If by this new method of treatment the volatile hydrocarbons, which we all regret to see going away in the tar, can profitably be retained in the gas, and made to do duty in keeping up the illuminating power, and the permanent nature of the gas so manufactured can be established, I am certain one and all of us will hail it with delight. I trust that the paper to be read will be the means of eliciting a great amount of useful information on this subject, and I would desire to impress on every one present the duty which rests on him of expressing his opinions, or asking such questions as may appear to him to have any bearing on any part of the subject, so as to give the patentees an opportunity of answering them, and of disabusing any one of any erroneous impressions which may be entertained by him, so that the whole matter may be subjected to a thorough and searching inquiry; and this, I hope, will take place in justice to ourselves and to the gentlemen who are so kindly here to-day to give all information in their power to enable us to form a proper judgment on it.

Lately the electric light has been again revived and brought prominently forward as a means of artificial illumination. For my own part, I do not anticipate that it will at all prove a successful rival to gas. People not only want a light; they also want one over which they have full control, and which they can moderate or increase at pleasure, and which, at the same time, is simple and easily managed. With gas we have all this, and I am convinced nothing to fear from the electric candle.

The process described by Professor Barff, who takes advantage of the natural propensity of iron to oxidize, thereby rendering it non-corrosive, is calculated to be of really great service, not only to ourselves, but to many others. In gas-works it will save a considerable amount of labour, which is at present necessary in preserving our structures from oxidation, and will render possible, and even profitable, the application of malleable iron tube for service-pipes, where its use is at present precluded by its tendency to rapidly oxidize and become leaky.

You have before you to-day models of various inventions, to which I would invite your attention. Mr. Foulis, of Glasgow, has invented and patented a governor, which I understand is giving satisfaction, a model of which is here, and can be seen working. Mr. Dalziel, of Kilmarnock, has also sent the model of a meter lately patented by him, and which he no doubt will willingly explain to any one. Mr. Sugg's illuminating power meter is also here for inspection; also Mr. Warner's thimble and market stand-pipe.

The papers to be communicated to us to-day are all of an interesting nature, and I will not detain you longer from the enjoyment of these, but would again desire to thank you for the honour you conferred upon me in electing me President of this Association.

Mr. Reid (Leith): I have no doubt, gentlemen, you will all concur with me in expressing our very high appreciation of this excellent and thoughtful address by the President. It is quite an unusual thing for such addresses to be subjected to discussion, but I may say that I think our President has suggested many useful things, and I move that we vote him our warmest thanks for the very admirable manner in which he has brought forward matters of the deepest interest, and suggested them for our consideration. I should mention that we will be disappointed if the whole substance of this Inaugural Address does not appear in the Journal of Gas Lighting, and I hope, at least, we shall have it in full in our own yearly transactions.

The motion was carried with acclamation.

Auditor's Report.

The President stated that, owing to the loss sustained by the death of Mr. Fraser, the committee found it necessary to appoint Mr. Peebles interim auditor, and he would now give in his report.

Mr. Peebles then read the report, which showed a balance of £20 in favour of the Association. He added that Mr. Mackenzie, the secretary and treasurer, did everything in such an excellent way, and so well brought forward, that the duty of auditor was easily discharged. He (Mr. Peebles) called attention to the number of arrears standing in the books, and he hoped an effort would be made to pay them up.

Mr. Robb (Haddington): I propose that if a member does not pay his subscription for two years, his name should be struck off the list.

Mr. Lawrence Hislop: I second the motion. I think it is quite right that no one should be continued a member of the Association who is more than two years in arrear with his subscription.

Mr. Reid: I think that is a little harsh. I happen to be a member of some associations or societies where there is what is called a suspense list, on which gentlemen are kept for two or three years, and at the discretion of the society one or more names are deleted; but there is no such thing as an absolute rule to deprive any one of membership for being in arrears.

Mr. Robb: I would leave it to the discretion of the secretary.

The President: It is putting him in a rather delicate position, leaving the thing entirely in his hands.

Mr. Whimster (Perth): Might I be allowed to suggest that the secretary make up a list of members in arrears, and state what notice he has sent to them, and submit it to the committee, and let their recommendation come before the annual meeting for decision regarding this rule, after which the matter could be left in the hands of the secretary and committee?

Mr. Robb: I am quite willing that it should come before the committee; but I am not proposing the alteration of a rule, but a new rule altogether, and I am willing to give notice of it for next meeting, as I think something should be done.

The Secretary read section 9 of the bye-laws, with reference to the proposal of motions.

Mr. Hall (St. Andrew's): Does the secretary remit one of the yearly reports to each member, whether he has paid his subscription or not?

The Secretary: I have been in the habit of doing so.

Mr. Hall: I would be inclined to propose that it should be notified to members in arrears that the report will not be continued unless the arrears are paid.

Mr. Robb: I undertake to send notice of my motion to the committee for next year's meeting.

The matter then dropped.

Election of Office-Bearers.

The President read the report of the scrutineers, from which it appeared that the following gentlemen had been elected office-bearers for the ensuing year:—

President.—Mr. J. Hall, St. Andrew's.
Vice-Presidents.—Mr. Alexander Smith, Aberdeen; Mr. Peter Watson, Stirling.
Committee.—Mr. J. K. Watson, Edinburgh; Mr. Andrew Scott, Musselburgh; Mr. William Dunlop, Hamilton; Mr. Samuel Stewart, Greenock; Mr. G. R. Hislop, Paisley; Mr. David Terrace, Arbroath.
Secretary and Treasurer.—Mr. William Mackenzie, Dunfermline.
Auditor.—Mr. D. B. Peebles, Edinburgh.

Mr. Hall: I could have wished your choice had fallen on some one better fitted to occupy the chair; but as it is, I must accept the alternative—I do not see my way out of it. You will allow me to say that, with your indulgence, forbearance, and help (for I think you can all be a great help in making our meetings a success or a non-success, and they have been a great success in years that are past), I promise that I shall use my endeavours not to allow the Association to go down as far as I am concerned. This meeting promises to be a success, and, with your indulgence, I shall do my best to occupy the chair so as to make our next meeting equally successful.

Next Meeting.

The President suggested that it would be a compliment to the President-elect to hold next year's meeting at St. Andrew's.

Mr. Robb: I think we ought to hold our meetings in Edinburgh and Glasgow alternately.

Mr. Whyte (Seaham): The members of the Association can easily afford the time to go to St. Andrew's, if they have the inclination.

Mr. M'Gilchrist seconded the proposal of the President.

Mr. Reid expressed himself in favour of Edinburgh.

Mr. Hislop (Paisley) asked what was the use of going round the country in this way. The meetings would be more largely attended if they were held in Edinburgh or Glasgow, and he proposed Edinburgh for next year.

Mr. Hall: Perhaps it would be a little selfish on my part to encourage going to St. Andrew's, but it must be remembered that there is a considerable number of gas managers north from this, and north from St. Andrew's. We have a large number of gas-works between this and Aberdeen and Inverness, and I think we should bear this in mind in fixing our place of meeting. It would certainly be an honour to me to adopt the President's proposal. We had a talk over the matter before, and I have in my eye an excellent place of meeting, and I am sure the Professor of Chemistry in the University would be very glad to give us a lecture. I should be very sorry to inconvenience any gas manager, and I am quite willing to agree to Edinburgh, or whatever other place is fixed upon.

Mr. Robb seconded the proposal to go to Edinburgh.

Mr. M'Gilchrist: My experience in connexion with the Association having a meeting in Glasgow is that it does not tend to large attendances, as when members come to Glasgow they have a great many business people to see, and they keep running out of the meeting, whereas if we go to some outlandish place the members are allowed to give the whole of their attention to what is brought before them. I know in Edinburgh we had not such a large attendance as we have to-day, and in Glasgow the meeting was the worst attended for five years, there being more at the dinner than at the meeting.

Mr. Whyte: As a member of the British Association, I have a feeling that it is better to have the meetings scattered over the country than always in the same place.

Mr. Reid: There has been a good deal of special pleading for St. Andrew's, but Edinburgh is easier reached by the majority of the members.

Mr. Mitchell (Dundee): I propose Perth as a most central place. I must say St. Andrew's is not suitable, especially if we agree to extend the meeting over two days.

The Secretary: From my experience, and the amount of correspondence I have had with the members generally, I would like to propose Glasgow next year as being the most fitting place to have a successful meeting.

Mr. Dick (Kincardine) seconded this proposal.

A show of hands was then taken, the result being a majority for St. Andrew's, which was accordingly fixed as the place of next year's meeting.

On the motion of Mr. Mitchell (Coatbridge), it was agreed to fix the second Thursday in July as the date of meeting.

Mr. Nelson (Glasgow) proposed that the meeting should occupy two days.

Mr. Robb: I have been thinking of that; and another thing that suggested itself to my mind was that we should devote more of our time to talking over our own affairs, and subjects connected with our profession, such as machinery, fittings, &c., and dispense with the scientific lecture. If the members were anxious to hear such lectures, we could set apart a day for that purpose.

The Secretary stated that the committee had under consideration the

proposal to extend the time of the meeting, and would be prepared to submit a recommendation to the next annual meeting.

Mr. DICK moved that the meeting be held in the third week of July, which was seconded by Mr. GEMLOW; but the President pointed out that the date had already been fixed, and the subject dropped.

EXPENSES OF ATTENDING MEETINGS.

Mr. ESPLIN (Forfar) handed up the following motion, which was read by the secretary:—"That the committee be instructed to ascertain the names and addresses of conveners of gas committees and chairmen of boards of directors, and send to each a circular, anent the proposal that companies and corporations should defray the expenses of their managers whilst attending the meetings of the Association." He said: This motion, which I beg to submit, just embodies the suggestion of the committee, and what we heard in the President's address. It struck me that a proposal, emanating from managers of works would not be received; in fact, not many would like to suggest such a thing to the directors or chairman of a company, or to the convener of a gas committee, and it seems to me it would meet with better success if we submitted it in the form I propose. It is a circular emanating from the secretary, and detailing the direct advantages accruing to companies and corporations by the regular attendance of managers at these meetings.

Mr. BLAIR (East Wemyss) seconded the motion.

Mr. REID referred to the result of a similar circular sent out some years ago. He did not know that there was a single response.

Mr. WHIMSTER suggested that the editor of some popular paper should be got to insert an article setting forth the advantages of the Association's meetings.

The PRESIDENT: I understand the failure of the previous appeal was owing to the circular not reaching the chairmen of the companies, and any new circular should be addressed to them direct, and not sent through the managers.

Mr. HISLOP (Paisley) agreed with Mr. Whimster's suggestion.

The matter was then left in the hands of the committee.

The reading of the Papers was afterwards proceeded with. These, and a report of the discussions thereon, will be given in the next number of the JOURNAL.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is very little animation in any branch of the local iron trade, notwithstanding the fact of the quarterly meetings having passed over quietly, and the more notable fact that the purchases for the quarter ought now to be in hand. In reality such negotiations are being conducted, but they affect so little iron in the aggregate, that it cannot be said, even by the most optimistic observer, that the industry is in a satisfactory condition. Pig iron, taken on the whole, is a little weaker, and some of the smelters manifest a disposition to enter into contracts for three or four months deliveries at 1s. 6d. to 2s. less money than they would recently have accepted. Approximate current prices range about as follows:—"Aireside Leeds," No. 1, 52s.; No. 2, 47s. 6d.; No. 3, 47s.; No. 4, 46s.; Forge, 46s.; M, 45s.; W, 44s.: "Acklam, Yorkshire," No. 1, 47s.; No. 2., 45s.; No. 3, 43s.; No. 4, 42s.; Forge, 42s.: North Yorkshire G. M. B., No. 1 foundry, 44s.; No. 2 foundry, 42s. 6d.; No. 3 foundry 40s. 6d.; No. 4 foundry, 40s.; No. 4 forge, grey, 39s. 6d.; No. 5 forge, mottled, 39s.; No. 6 forge, white, 39s.; refined metal, 57s.; Kentledge, 43s.; cinder, 37s. 6d.: Lincolnshire, No. 1 foundry, 58s.; No. 2, 55s.; No. 3, 53s.; No. 4 forge, 49s.; mottled, 47s. 6d.; white, 48s.; Derbyshire foundry, 45s. to 55s.

At some of the leading foundries there is a steady business in course of execution, but, as a rule, even the larger houses in this line are very indifferently engaged.

Fuel of all kinds is exceedingly plentiful, and a good deal of difficulty is experienced in getting rid of the output of the larger concerns. A considerable tonnage is being sent to London, and there is a pretty good export of steam coal from the three chief Humber ports to Russia, Sweden, France, Denmark, and Holland. Steam coal is quietly held at 8s. to 9s., large lots being, possibly, obtainable at something under the former quotation. In gas coals there has been a little "shading" of prices in the renewal of contracts. I hear that one of our best colliery firms is offering gas coals of known quality in truckloads at 16s., delivered at certain roadside stations in South Lincolnshire.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

As I anticipated in my last report, the men in West Lancashire have been compelled to give in, and, after a strike extending over six or seven weeks, it has been resolved to resume work on the masters terms; but a resolution has at the same time been passed to ask for an advance on the 1st of September. Some of the men had got to work on Thursday, and the remainder it was expected would go in yesterday (Monday). So far as trade is concerned everything continues very quiet, and consumers of gas coal still display no anxiety to give out their contracts, although prices show no material change, good screened Arley, at the pit's mouth, being quoted at 9s. per ton. For the better classes of round coal, for house fire purposes, there is little or no inquiry, and, with the majority of the Wigan pits stopped, supplies have been in excess of the demand, with prices tending downwards, and common coal, although there is still a demand for kitchen and locomotive purposes, is plentiful in the market. Yorkshire and Derbyshire houses are competing very keenly in this district, some of them offering at incredibly low prices, and much below what Lancashire colliery proprietors are prepared to take. Engine classes of fuel generally continue very steady in price, the better sorts not being at all plentiful in the market, although there does not appear to be quite that scarcity which was complained of a week or two back. The average pit prices may be given about as under:—Good Arley, for house fire purposes, 10s. per ton; for gas-making purposes, 9s. per ton; Pemberton, four-feet, 8s. to 8s. 6d.; good ordinary screened gas coal, 7s. 9d. to 8s. 6d.; common coal, 6s. 6d. to 7s. 6d.; burgy, 5s. 6d. to 6s.; and slack, 4s. 6d. to 5s. 3d. per ton.

The shipping trade is still very dull, the local colliery proprietors being to a great extent kept out of the market by the lower prices ruling in other districts.

There is no improvement to report in the iron trade. Prices are much about the same, having now reached about the lowest possible point; but there is little or no demand from consumers, and there is not sufficient confidence in the future to encourage speculative purchases. The quotations for Lancashire pig iron, for delivery into the Manchester district, are 55s. for No. 3 foundry, and 53s. for No. 4 forge, less 2½ per cent.; and Middlesbrough is offered at 48s. 9d. for No. 3 foundry, and 47s. 9d. for No. 4 forge, net cash. Middlesbrough bars are lower in price, being now offered at £6 10s. per ton delivered here, but local makes remain at £6 12s. 6d. per ton.

Some of the local waggon builders are tolerably busy in railway orders, but works generally throughout this district are very slack, and as such cannot keep their men anything like fully employed.

THE COAL AND GENERAL TRADE OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

There was a large arrival of coasting tonnage in the northern coal ports last week. They were mostly small vessels, and they seemed to be needed, as a pretty sharp business was done in freighting, and rates, instead of falling, advanced just a trifle. Business is a little stiffer for France, and a fair trade was transacted with the lesser ports of the British Channel and the east coast of England. There were fair shipments of gas coals from the Tyne Dock. The first-class collieries ask 8s. 6d. per ton for gas coals; but a good quality of gas coal may be bought in any quantity at 7s. 6d. per ton with the usual 2½ per cent. discount. Inferior sorts realize no more than about 6s. per ton. The arbitration with regard to the wages of the Northumberland miners will finish some time about the middle of this week. The umpire, no doubt, will have to decide. Steam coals vary a good deal in price. They range from 12s. 6d. to 9s. 6d. per ton, according to quality. The first-class colliery offices state they have a number of orders on hand, with turns a little long, but all sorts of medium and second-class steam coals are abundant in the market, and difficulties are experienced in getting a vend. In fact, part is sent away to the Continent upon consignment. House coals are unchanged in value. They may be quoted from 11s. to 12s. best, and from 9s. 6d. to 10s. seconds. The fleet of steamers belonging to the North of England experience a greater difficulty every week in finding any employment. Profitable employment, indeed, there is none. The ordinary quotation to Cronstadt is from £8 to £10 per keel. It is now from £5 5s. to £5 10s. per keel. Copenhagen and other sound rates in ordinary times average from £7 to £8 per keel. They are at the present time quoted at £4 10s. per keel, and so all the way round. There is little business transacted with the Mediterranean, and, as we have before reported, freights will, in all probability, greatly favour the shippers for the remaining months of 1877.

The general manufacturing trade of this district gives no indication of any revival; prices, as a rule, are low. The shipments of fire-clay goods, favoured with low freights, are very well maintained. The shipments of fire-bricks to France are pretty good. The German trade, however, is poor. There seems to be an average of orders for home use. The iron trade of the Cleveland district is not a bit better. It could not be worse. There is a movement in these northern parts, which is pretty general, for the readjustment of wages to the altered state of business. This will go on, no doubt, until there is a revival of trade. The hand-to-mouth sort of business which prevails, poor as it is, shows a constant tendency to fall away. Manufacturers and merchants generally have to be making constant efforts to get their goods sold, even at the present low figures. The chemical trade, which is very often subjected to great fluctuations, never was in a more depressed state than at present. Some spasmodic efforts were made about a month ago to improve prices, but they have entirely collapsed.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On Wednesday last, the annual meeting of the shareholders of the Montrose Gaslight Company was held. Mr. R. Waller, banker, occupied the chair. The receipts showed an improvement on the preceding year's state of affairs, and a dividend of £3 per share, valued as at £40 per share, was declared. No reduction in the price of the gas was resolved on, as anticipated by the public, but hopes were entertained that such would take place at the annual meeting in 1878.

The special statutory meeting of the Forfar Gas Commissioners was held on the evening of Monday, the 16th inst. From the annual accounts it was shown that the past year's surplus, from the reduction in the price of gas, had come down from £1400 to £900.

At the last monthly meeting of the Broughty Ferry Police Commissioners, the statement of the affairs in connexion with the Gas Commission, for the year ending May 31, was brought forward and considered. After deducting the sums required for annuities, sinking-fund, interest on capital, discounts to consumers, part payment of the cost of the new gasholder, and payment of the whole cost of the new purifiers and sheds, there was still a balance of £361 8s. 5d. to the credit of the profit and loss account. During the year 1608 tons 13 cwt. of coal had been used, producing 17,158,200 cubic feet of gas, equal to 10,670 cubic feet per ton, as compared with 1518 tons of coal, producing 16,262,400 cubic feet of gas, equal to 10,713 cubic feet per ton, in the preceding year, the increased production being 895,800 feet of gas.

The annual meeting of the Kirkcaldy Gas Company was held last Wednesday. In the abstract of accounts it was shown that, amongst other items, the expenditure for the past year had been £1424 11s. 2d.; that the mains had been increased by 2 miles 933 yards, and now extend to 22 miles 567 yards. The manufacture of gas for the year was 38,968,000 cubic feet; the waste was 7,089,900 feet, or 18 per cent.; the profit was £1560 16s. 2d., and a dividend of 7½ per cent. was declared on the £10 shares. The quality of the gas had been 28 candles. The directors recommendation that the price of the gas be reduced from 4s. 4½d. per 1000 feet to 4s. 2d.—the reduction to take place at the first collection of the present month—was approved of. The report was deemed a very satisfactory one.

At a meeting of the Burntisland Town Council last Tuesday, the clerk intimated that the North British Railway Company had submitted to pay the additional assessment on their gas-works rather than go into Court. The question of the burgh acquiring the existing gas-works or erecting new works was discussed at some length, and a special meeting of the council was resolved upon, with the object of considering and adopting the Burghs Gas Supply Act, if they saw fit.

For a brief space of time between nine and ten o'clock on the evening of Friday week, the town of Musselburgh was in temporary darkness. This depression in the gas supply was caused by the vibration of the gasholder from the firing of the Midlothian Coast Artillery Battery, which adjoins the gas-works. The effect was to throw water into the main-pipe. The manager of the works, however, was quickly enabled, by a simple diversion, to restore the usual supply of gas. As the street-lamps are never lighted at this season of the year, and as darkness, at any rate, had not set in, no inconvenience was experienced upon the streets from the occurrence.

The annual meeting of the Berwick Gas Company was held last Wednesday, and from the annual report and balance-sheet, which were submitted by the directors, it was shown that the total income for the past year had been £4789 7s. 8d., and that after payment of all expenses there remained a balance of profit of £1171 4s. 2d., from which the directors recommended a payment of 10 per cent. The directors announced that they had resolved to reduce the price of gas from 6s. 3d. to 5s. 10d. per 1000 cubic feet.

The shareholders of the Lockerbie Gas Company held their annual meeting on Monday, the 16th inst.—Dr. Wilson presiding. From the statement of accounts it was shown that the expenditure of the company for the past year had amounted to £500, and the income to £669 4s. 5d., leaving a balance for dividend purposes of £169 4s. 5d. A dividend of 7 per cent. was declared. As the demand for gas had been in excess of the supply, the directors had some time ago accepted estimates for the

erection of a new gasholder, and the company empowered the directors to borrow £1000 to meet the outlay on the new works.

At the annual general meeting of the Kirkcudbright Gaslight Company, held some days ago, the directors recommendation to declare a dividend of 7½ per cent. on the profits of the past year was unanimously approved of by the shareholders present.

On Tuesday, the 17th inst., sixty-one £5 shares of the Ayr Gas Company were sold by public auction, in lots of ten shares each, the odd one being added to one of the lots. They realized £6 7s. per share.

The annual meeting of the Millport Gaslight Company was held on Monday, the 16th inst.—the Earl of Glasgow in the chair. The different reports were read and adopted, and a dividend of 7½ per cent. was declared on the profits of the past year's transactions.

At the statutory meeting of the Greenock Police Board, held last Tuesday, the secretary for the gas-works laid on the table a statement of the revenue and expenditure for the year ending June 30, 1877. It showed a total revenue of £37,550 16s. 3d., being £603 15s. 1d. less than that of the preceding year. The expenditure amounted to £31,087 11s., thus showing a clear surplus of £6463 5s. 3d. This was after deducting a sum of £1004 0s. 7d., paid for gas-meters and for main and service pipes. The profits were apportioned as follows:—To the Police Board, £4000; repayment of capital, £2400; and to the contingent-fund, £63 5s. 3d. The report was adopted. No change was made in the price of gas; but, in referring to that matter, the provost mentioned to the price paid in a number of other towns, by way of showing that the people of Greenock had no occasion to complain of the price which they were charged for gas.

Owing to some necessary repairs and alterations going on at the gas-works at Milngavie, the inhabitants of that burgh have had no gas since last Friday week, and have been compelled to fall back upon paraffin lamps and candles. They will be glad when the gas is restored, probably by the 24th inst.

Dr. Wallace's report upon the quality of the Glasgow gas for the week ending July 14 shows that in no case was the illuminating power under 25·90 candles, while the average at three testing-stations ranged from 26·54 candles to 29·08 candles.

New water-works for the village of Sauchie, in Fifeshire, are almost completed, and similar works are about to be commenced for the neighbouring village of Coaltown.

On Thursday last the Dumfries Water Commissioners visited their works at Lochrutton, and found them in a satisfactory state. The recent improvements have cost over £3000; and the total debt is between £13,000 and £14,000. The income exceeds £2000 a year, and it is expected that the commissioners will now be able to reduce the debt at the rate of £1000 per annum.

A new reservoir, to hold 80 million gallons of water, has been completed to the entire satisfaction of the directors of the Kilmarnock Water Company. At the annual meeting of the company, held on Friday, the profit for the past year was said to be £2110 11s. 9d. The dividend declared was 6½ per cent. on the ordinary and 4 per cent. preference stocks, and 6 per cent. on the 4½ per cent. preference stock.

At last Tuesday's meeting of the Greenock Water Trust it was reported that, during the past six months, the rainfall had been 36·37 inches, or 90 per cent. above the average of the same months in past years.

On Wednesday last the foundation stone of the filters in connexion with the new water-works for the town of Irvine was laid with great ceremony and amidst much rejoicing.

The usual quarterly returns connected with the Aberdeen Water-Works have just been printed. The total consumption from the low-service reservoir during 24 hours in which it was gauged was 3,922,900 gallons, and from the high-service reservoir, 147,060 gallons—being a total consumption of 4,069,060 in the course of one whole day. The smallest amount of consumption per hour from the low-service reservoir in the course of the 24 hours was from one to two a.m., from three to four a.m., and from four to five a.m., when, in each of these hours, the consumption measured 118,400 gallons. The largest amount of consumption was from eleven to twelve a.m., and from twelve to one p.m., when, in each of these hours it measured 222,000 gallons. The sluice-keeper at the intake and Invercannie reservoir reports that during the quarter ending June 30, the river was "very clear" on 21 days, "clear" on 62 days, and "brown" on eight days. On the 5th of April the intake sluices were shut, and no water was taken from the river, on account of its muddy state. The depth of water in the Invercannie reservoir averaged from 12 to 14 feet. In the course of the quarter the water inspectors found in the city 90 water-cisterns, 41 water-closets, 156 water-taps, and 16 water-pipes in a leaky state, but these had all since been repaired.

New water-works, estimated to cost £2100, have just been commenced for the town of Newburgh, in Fifeshire.

A firmer and improving tone has been manifested in the Glasgow pig iron market since the fair holidays terminated. A good business was done last week, and though little advance was made on the price, the aspect of the market became more encouraging as the week progressed. Friday's closing prices were 54s. 4½d. cash, and 54s. 6d. one month.

There is no special feature to note in the position of the local coal trade. Prices are not high enough to tempt coalmasters to increase their output.

METROPOLITAN VESTRY AND DISTRICT BOARD EXPENDITURE.—A return has recently been made to an order of the House of Lords of the sums expended by Vestries and District Boards within the Metropolitan District, exclusive of the City of London, upon paving, lighting, drainage, water supply, sanitary arrangements, and other works, not under the jurisdiction of the Metropolitan Board, during the years 1874, 1875, and 1876. The totals under each head of expenditure for the three years were as follows:—

Paving	£1,741,935	5	5
Lighting	707,302	4	8
Drainage	352,164	8	0
Water supply	208,174	15	2
Sanitary arrangements	436,934	4	7
Other works	651,123	17	9
Total expenditure	£4,097,634	15	7

SEVENOAKS WATER-WORKS COMPANY, LIMITED.—The annual meeting was held on the 17th inst.—Mr. W. J. Thompson in the chair. The directors reported that during the past year there had been a steady increase in the demand for water, and, consequently, a more favourable balance at the credit of profit and loss account. The accounts of the company had been adjusted, and some items belonging to capital, but which had been previously charged to revenue, transferred to capital account. The result showed a balance of £1998 7s. 1d. available for dividends for the last three years. The directors, therefore, proposed that a distribution at the rate of 10 per cent. should be made for the years 1874-5, payable on the 21st. inst, and a further dividend of 10 per cent. for the year 1876, payable on Jan. 1, 1878; and in order to put themselves into a position to pay the accumulated dividends which had been employed in providing necessary plant, &c., the directors proposed to issue the remaining share capital, to be offered rateably to the present shareholders. This would also provide for the necessary working capital, and for any new works which might be required. The engineer and manager's report was that water from the company's main had been laid on to 45 new premises during the past year, which would produce a rental of £106 10s. 6d. per annum. He continued to extend the mains into new districts, where they might soon reasonably expect a large increase of customers. The balance-sheet showed that £8890 had been received on shares, and £2500 on debentures, and that the water-rents for the year amounted to £1748 8s., and £644 1s. 10d. was credited to fittings and extensions. The report was adopted, and a formal resolution for giving effect to the directors recommendation was carried.

BOLTON CORPORATION GAS-WORKS.—Mr. Harrison Veevers has reported to the Gas Committee that in the year to June 30 (which is the end of the financial year), the quantity of gas made was 420,836,000 feet, from 38,929 tons of cannel and coal, averaging 10,810 feet per ton. In the previous year the quantity made was 404,422,000 feet, from 38,622 tons of cannel and coal, giving an average of 10,473 feet per ton. The value of the gas made from the cannel and coal this year in excess of last year will be nearly £2000, and is in part to be attributed to the excellent condition of the retorts, and in part to the better quality of the cannel and coal. The increased quantity of gas made this year over the last is 16,414,000 feet, or at the rate of 4·05 per cent. Mr. John Berry, lighting inspector to the corporation, in his report, says that during the lighting season of 1875-6, the public lamps consumed 12,822,842 cubic feet of gas, and they were lit 2240 hours. During the same season of 1876-7 the lamps consumed 14,490,228 cubic feet of gas, or an increase of 1,667,386 cubic feet, and they were alight 2508 hours, or an increase of 268 hours.

GAS-WORKS EXTENSIONS AT CHESTERFIELD.—During the last twelve years the undertaking of the Chesterfield Gas Company has been doubled, and it has been found necessary to construct new works entirely. For the last five years these works have been in course of erection, and as parts or sections of them have been completed, they have been brought into practical operation. Another portion of these buildings has just been completed—viz., the shaft of the new retort-house. This structure, which is octagon in shape and annular in construction, is ornamented at the top by an immense cast-iron cap, weighing 11 tons, and by a cast-iron railing. Its height from the floor is 133 feet 6 inches, and was built from bottom to top by outside scaffolding of apparently elaborate and skilful construction and design. This immense block has been completed without a single accident of any kind, and on Saturday, the 30th ult., a party of ladies and gentlemen assembled at the gas-works and ascended the shaft, the ladies being hoisted to the top by steam machinery. Amongst those present were Mr. R. T. Gratton, chairman of the company, and Mr. C. E. Jones, resident engineer and manager of the company. Mrs. C. E. Jones performed the interesting and somewhat novel ceremony of "christening," and in naming the shaft "Success," wished that all the undertakings of the Chesterfield Water-Works and Gaslight Company might be as successfully completed as the graceful structure on which they stood. The party having descended once more to *terra firma*, they adjourned to the board-room, where the "loving cup" having been passed round, Mr. Jones gave the "Health of the Contractors," and complimented them upon the efficient manner in which they had carried out the work entrusted to their care, without the loss of a life or the fracture of a limb. The health of Mr. Jones was then given, and heartily responded to, and other toasts followed.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

2670.—ROBINSON, J. and F. J., Bradford, York, "Improvements in the method and construction of packing, chiefly applicable to stuffing-boxes and other like purposes, and for forming the joints of steam, water, or gas-pipes." July 11. 1877.

2687.—SOLVAY, E., Brussels, Belgium, "Improvements in the treatment of bicarbonate of soda obtained in the ammoniacal process, and in means and apparatus for increasing the density of soda and for rendering it caustic." July 12, 1877.

2710.—MORGAN-BROWN, W., Southampton Buildings, London, "A new and improved automatic gas-lighter." A communication. July 14, 1877.

2716.—ORTMANS, V. C. J., Brussels, Belgium, "An improved rotatory pump or apparatus for raising and forcing fluids; applicable also as a motive-power engine, and for other purposes." July 14, 1877.

2725.—HANSON, J., Dewsbury, York, "Improvements in treating sewage and other foul water by the use of liquids only, also an improved method of treating sewage and foul water by the use of solid ingredients combined with liquids, and improvements in softening clarified and hard water." July 16, 1877.

2749.—SIMON, L., Nottingham, "Improvements connected with atmospheric gas-engines." July 18, 1877.

2757.—CRAIG, W., New Cross, London, "Improvements in direct-acting steam-pumps." July 19, 1877.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

5013.—KENNEDY, T., Kilmarnock, N.B., "Improvements in water-meters." Dec. 28, 1876.

5035.—PAGE, W., Newcastle-on-Tyne, "Improvements in valves, taps, or cocks." Dec. 29, 1876.

252.—CLERK, D., Glasgow, "Improvements in motive-power engines working with hydrocarbon gas or vapour." Jan. 19, 1877.

258.—NAWROCKI, G. W. VON, Berlin, "Improvements in apparatus for raising fluids." A communication. Jan. 19, 1877.

263.—HOUZEAU, J., DEVEDEIX, E., and HOLDEN, J., Rheims, France, "A new method of purifying town sewage and waters previously used in industries." Jan. 20, 1877.

272.—WALLACE, R. W., Battersea Park, and CLAUS, C. F., Great St. Helen's, London, "Improvements in the purification of gas, and the utilization of bye-products by the manufacture of secondary products therefrom." Jan 20, 1877.

315.—DUFRENÉ, H. A., Finsbury, "Improvements in burners for mineral and other oil, vapour, and gas." A communication. Jan. 25, 1877.

341.—COTTERELL, F. J., Birmingham, "An improvement or improvements in sliding gaseliers or gas chandeliers." Jan. 26, 1877.

349.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in pumps." A communication. Jan. 26, 1877.

358.—HUNT, B., Lincoln's Inn, London, "Improvements in direct-acting steam-engines for pumping and other purposes." A communication. Jan. 27, 1877.

413.—HUNT, B., Lincoln's Inn, London, "Improvements in pipe-joints." A communication. Jan. 31, 1877.

451.—FINCH, B., High Holborn, London, "An improvement in valve water-closets and in water supply-valves." Feb. 2, 1877.

494.—JABLOCHKOFF, P., Paris, "Improvements in electric lamps, and in arrangements connected therewith, for dividing and distributing the electric light." Feb. 6, 1877.

502.—CHATWIN, T., Birmingham, "Improvements in screw-wrenches or screw-spanners, and in gas-grips." Feb. 6, 1877.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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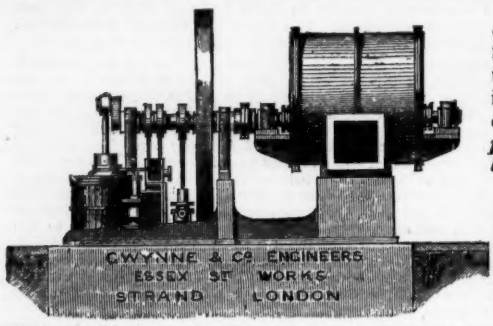
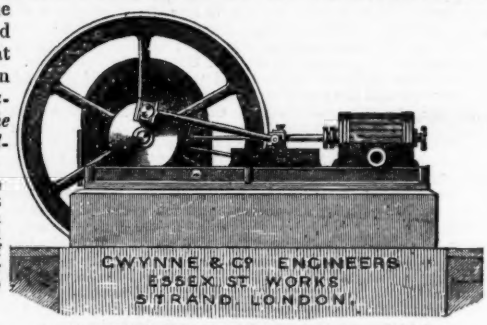


EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



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Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

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G. & Co. are now making 6 Sets Exhausters and Engines for 105,000 cubic feet per hour, 3 Sets 180,000 Exhausters and Engines, with many others of all Sizes.

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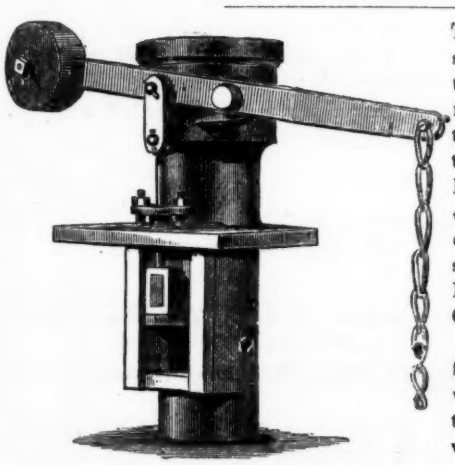

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By order,

JESSE SMITH, Town-Clerk.

Town-Clerk's Office, Dewsbury, July 12, 1877.

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Applications (with recent testimonials), addressed to "The Chairman of the Gas and Water Committee, 50, Hamilton Square, Birkenhead," and endorsed "Engineer," to be sent in not later than Friday, the 17th of August next. Personal canvassing prohibited.

By order,

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Birkenhead, July 16, 1877.

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THOMAS MOORE, Manager.
July 9, 1877.

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Tenders, stating amount in one sum for the work complete, to be forwarded to the undersigned, on or before the 11th prox.
By order,
JAS. DALGLIESH, Manager.
Gas-Works, Glossop, July 16, 1877.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Winchester Water and Gas Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR produced at their Works for a period of One year, commencing on the 14th day of September next.
Particulars and forms of tender may be obtained on application.
Tenders to be sent in addressed to the Manager, and endorsed "Tender for Tar and Liquor," on or before Monday, the 3rd day of September.

NEW GAS-WORKS.—TUNBRIDGE WELLS.

TO BUILDERS.

THE Directors of the Tunbridge Wells Gas Company are prepared to receive TENDERS for the Earthwork, Concrete Foundations, and construction of Coal-Store, Retort-House, Retaining-Wall, Station-Meter and other Houses, Clock-Tower, and Tar-Tanks, upon the site for their New Works adjoining the South-Eastern Railway, near the town.
Plans, sections, and specifications of the foundations and buildings may be seen at the Secretary's Office, 44, High Street, Tunbridge Wells, and at the Office of the Company's Engineer, Mr. R. P. Spice, 21, Parliament Street, Westminster, on and after the 27th inst., and lithographed copies of the quantities had of the Engineer, or of the Secretary of the Gas Company, on payment of one guinea for each copy.
Tenders, addressed to the Secretary of the Company at his Office, High Street, Tunbridge Wells, marked outside "Tender for New Buildings," will be received on or before Monday, the 27th of August.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
JOHN READ, Secretary.
Gas Office, Tunbridge Wells, July 21, 1877.

SALFORD CORPORATION GAS-WORKS.

THE Corporation of Salford invite Ten- DERS for the supply of CANNEL and COAL required at the various Gas Stations in Salford, for One, Two, or Three years, commencing on the 1st day of September next.
Forms of tender (upon which only tenders will be received), and all particulars, may be obtained on application to the Engineer, Mr. Samuel Hunter, Gas-Works, Lamb Lane, Salford.
Tenders, endorsed "Cannel and Coal Contract," to be delivered to me on or before the 28th inst.
The Corporation do not bind themselves to accept the lowest or any tender.
By order,
CHRIS. MOORHOUSE, Town-Clerk.
Town Hall, Salford, July 11, 1877.

OVER DARWEN LOCAL BOARD OF HEALTH—GAS AND WATER DEPARTMENT.

TENDERS FOR CANNEL AND COAL.

THE Gas Committee are desirous of receiving TENDERS for CANNEL and best screened GAS COAL that they may require for the Gas-Works, for the year commencing the 1st of August next, to be delivered, in equal monthly quantities, free at Over Darwen Station.
They will engage to take not less than 8000 Tons during the year, of the combined qualities that may be selected, about as follows:—7000 tons Coal, 1000 tons Cannel.
Sealed tenders, endorsed "Tender for Coal," specifying the description of Cannel or Coal, the pits at which they are to be raised, and quantities proposed to be supplied, to be sent to the undersigned on or before Tuesday, the 31st inst.
The person or persons whose tender may be accepted will be required to execute an agreement for the due performance of the contract, to be prepared by the Law Clerk of the said Board.
By order,
JOHN MARSLAND, Engineer and Manager.
Gas-Works, Darwen, July 5, 1877.

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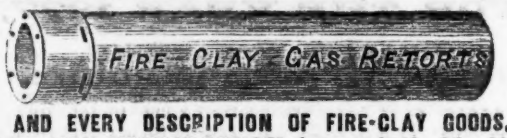
Manufacturers of FIRE-BRICKS, LUMPS, TILES,



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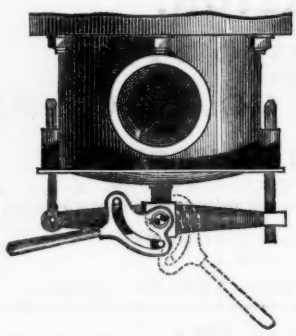

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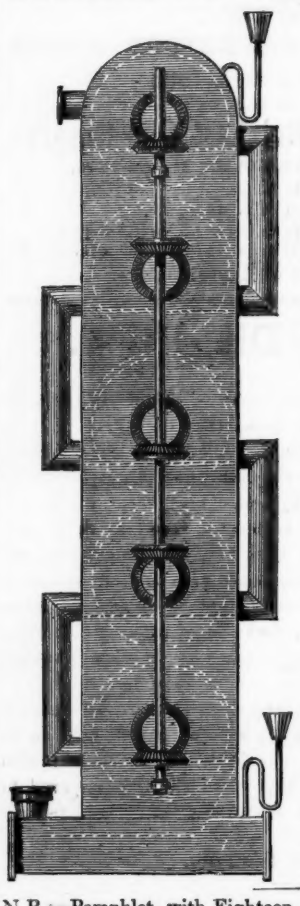

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It removes the whole of the ammonia from the gas, so that it will not discolour moistened turmeric paper.

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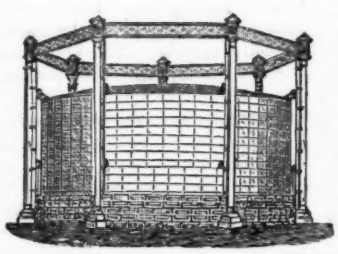

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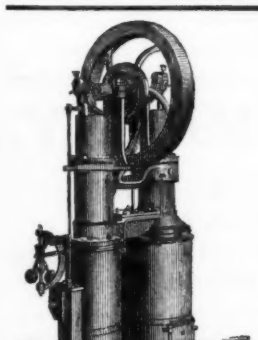

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BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

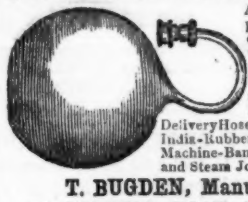
FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

CLOTH GAS-BAGS FOR MAINS,



As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

T. BUGDEN, Manufacturer,

79, GOSWELL ROAD, LONDON, E.C.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:
DARTMOUTH & BRIXHAM (TORBAY) DEVON.
OFFICES:
23, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

SOLE PROPRIETORS AND MANUFACTURERS OF
WOLSTON'S CELEBRATED

TORBAY IRON PAINTS.

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

READY-MIXED PAINTS.

A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

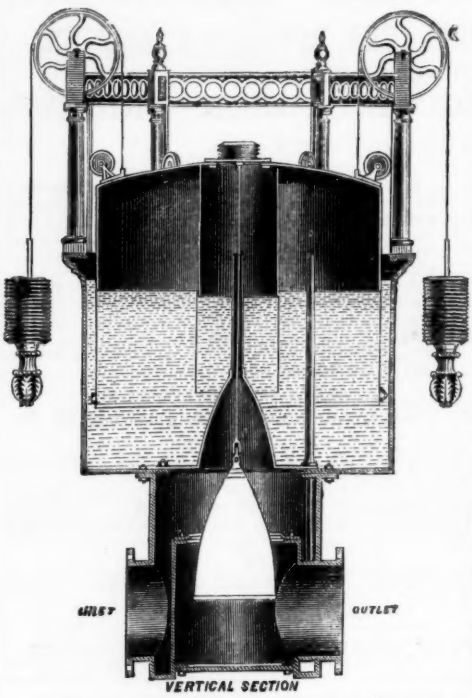
Prices and Testimonials on application.

J. & J. BRADDOCK,
GLOBE METER-WORKS,
OLDHAM,

Beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

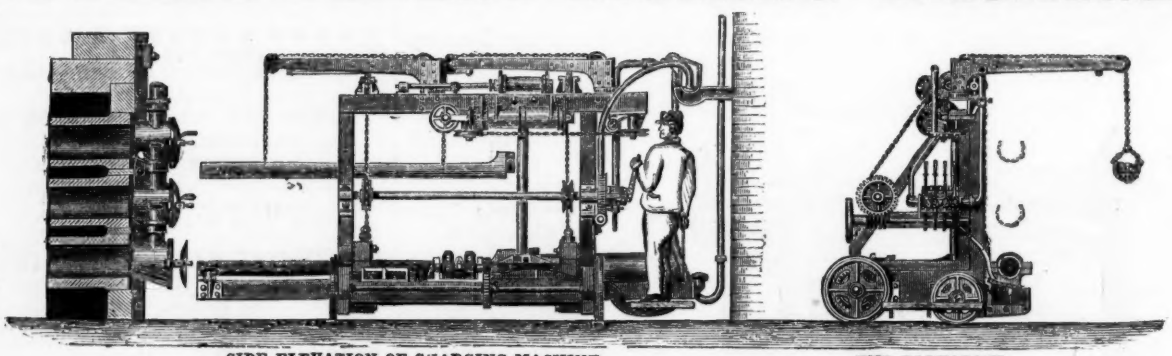
THE WIGAN COAL & IRON COMPANY,
LIMITED,

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN;

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

FOULIS'S PATENT STOKING MACHINE.


SIDE ELEVATION OF CHARGING MACHINE. END ELEVATION

(The Drawing Machine will be Illustrated in next week's Advertisement.)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz;
Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

S. OWENS & CO.,

WHITEFRIARS STREET, LONDON, E.C.,

HYDRAULIC ENGINEERS,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT STEAM-PUMPS,

More than 10,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

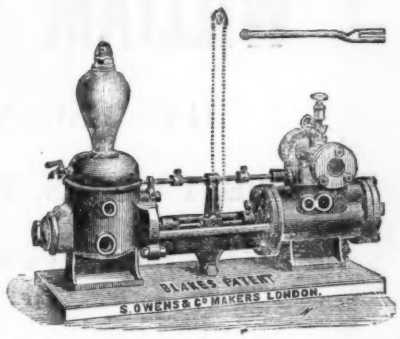
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF

MANN & OWENS

IMPROVED PATENT GAS-VALVES.

PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

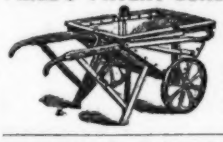
PATRONIZED BY THE ROYAL ARSENAL, WOOLWICH.

FERGUSON, Builder and Contractor. Kite method of Repairing Church Spires and High Chimneys. Chimneys straightened, pointed, and hooped. Old Chimneys pulled down by a process requiring no scaffolding or stoppage of work, by competent workmen, under personal supervision. For Lightning Conductors—cheapness and method of fixing—apply to C. R. FERGUSON, 12, Canal Road, MILE END.

CATHELS'S Patent Gas-Washer is an excellent cleanser of gas from tar, ammonia, sulphur, and carbonic acid, reducing the cost of subsequent purification 30 to 50 per cent. Needs no motive power or attention beyond drawing off and recharging as required. Has no moving parts or complications to get out of order. Is of moderate cost, and is practically indestructible.

Application to be made to the MANUFACTURERS, the Horseley Company, Tipton, STAFFORDSHIRE.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

THOMAS LAMBERT & SONS

MANUFACTURE EVERY DESCRIPTION OF

GAS AND WATER FITTINGS;

ALSO,

WROUGHT-IRON TUBES & FITTINGS.

SHORT STREET, LAMBETH, LONDON.

WILSON'S

PATENT SAFETY PRESSURELESS

AUTOMATIC DIP-PIPES,

Fixed or moveable, adapted to works of any size, without other alteration than removal of existing Dips.

W. P. WILSON, 98, ASYLUM ROAD, S.E.

BOUCK & CO., LIMITED,

TAR DISTILLERS & MANUFACTURING CHEMISTS,

MILES PLATTING, MANCHESTER.

BUYERS OF COAL TAR,

And Crude Products therefrom,

AMMONIACAL LIQUOR, &c.

JOHN ABBOT AND CO.,

LIMITED,

IRON AND BRASS FOUNDERS,

PARK WORKS, GATESHEAD-ON-TYNE.

London Office: 2, SUFFOLK LANE, CANNON STREET.

Glasgow Office: 54, ST. ENOCH'S SQUARE.

MANUFACTURERS OF ALL DESCRIPTIONS OF

HYDRAULIC MACHINERY,

INCLUDING

ACCUMULATORS, FORCE-PUMPS, CRANES, & LIFTS,

FOR

GAS-WORKS, WAREHOUSES, &c.

IMPROVED HYDRAULIC MACHINERY,

Specially Arranged for Lifting and Lowering Purifier-Covers, &c.

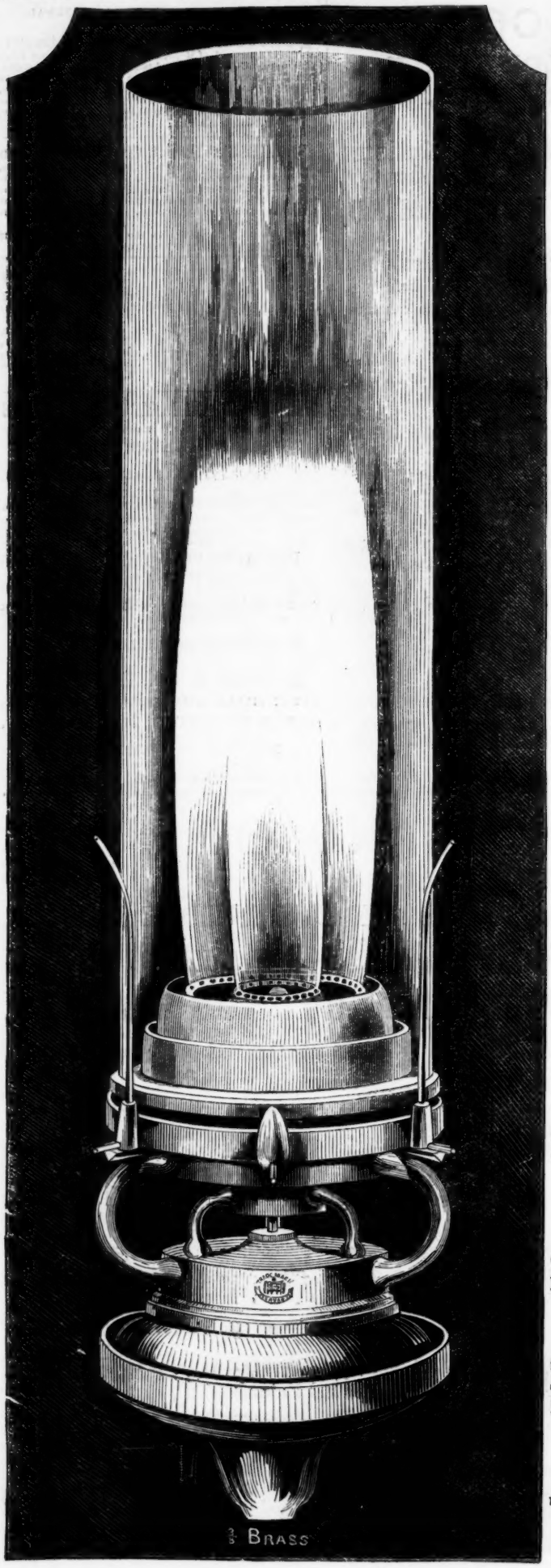
MAKERS OF

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS;

PIPES FOR GAS AND WATER WORKS;

ROOFS, COLUMNS, AND GIRDERS.

DESIGNS AND ESTIMATES SUPPLIED ON APPLICATION.



PARIS, 1867.

LONDON, 1862.

TRADE MARK.

WILLIAM SUGG,

GAS ENGINEER,

VINCENT WORKS, VINCENT ST.,

WESTMINSTER, S.W.

PATENT

"LONDON" ARGAND BURNER,

NEW SIZE, No. N., DOUBLE FLAME,

With Self-Acting Governor.

LIGHT EQUAL TO 45 Parliamentary Sperm Candles of Six to the Pound.

Will burn any Quality of Gas from 12 to 50 candles, with

A VERY WHITE AND STEADY LIGHT.

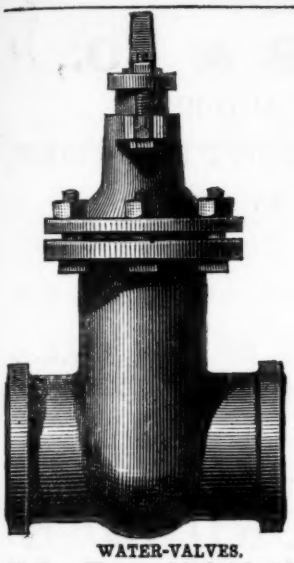
Price 18s. each, with Chimney.

☞ **This Burner gives a greater amount of light per cubic foot of gas consumed than any other Burner yet produced.**

It can be used with Albatrine Shade, 20-in. diameter, for large Dining-Rooms or Halls; or with Large Silvered or Enamelled Reflector for Shops or Warehouses; or for Harbour and Signal Lights, Clock-Towers, &c.

The Sizes of the Patent "London" Argand Burner are now as follows:—

OLD SIZES: Nos. A, B, C, D, E, F, G, and H.
NEW SIZES: J, K, and N.



WATER-VALVES.
All Sizes, Flange and Socket, kept in Stock, tested to 1000 feethead.

SIMPSON & COMPANY,

ENGINE-WORKS,

GROSVENOR ROAD, PIMLICO,

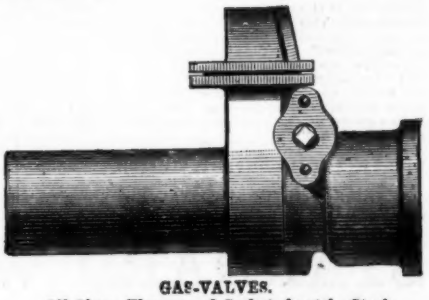
LONDON.

SCREW-COCKS, HYDRANTS,

SLUICES, PENSTOCKS,

And all other Machinery for

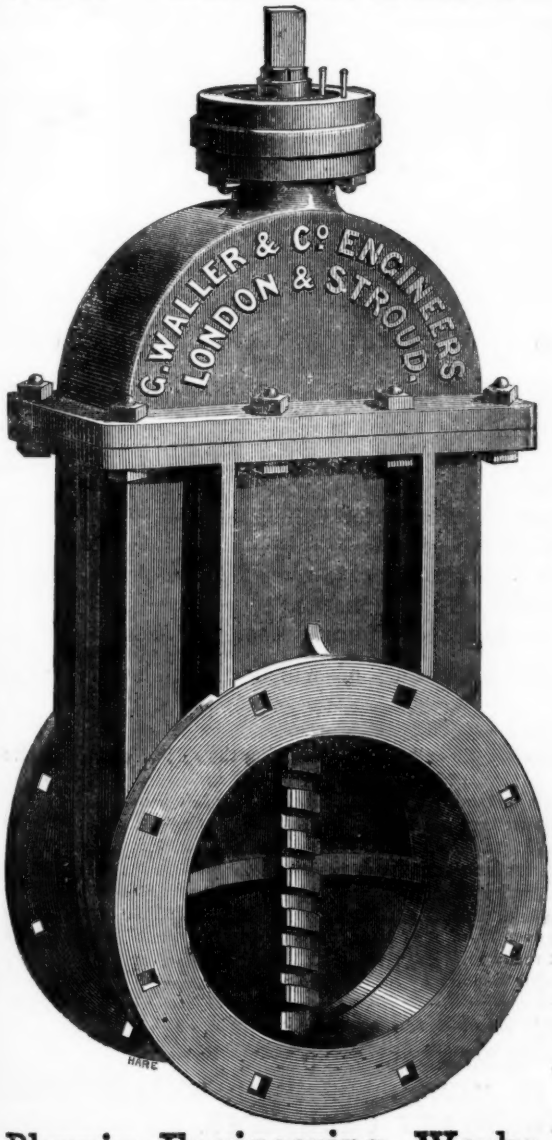
WORKS OF WATER SUPPLY, DRAINAGE AND IRRIGATION.



GAS-VALVES.
All Sizes, Flange and Socket, kept in Stock, tested to 100 feet head.

GEORGE WALLER & CO.,

GAS ENGINEERS AND CONTRACTORS.

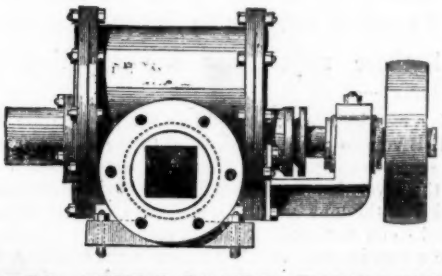


IMPROVED INDEX GAS-VALVE.

These Valves are constructed with Circular Wedged Backs, with the body *in one piece*, and are proved on both sides to 30 lbs. per square inch.

One man can open the largest Valve without gearing, and there are studs on the top of index which can readily be felt in the dark, to ascertain if the Valve is open or shut.

A large stock always on hand. Also good second-hand ones, removed during alterations and extensions of Gas-Works.



BEALE'S IMPROVED EXHAUSTER,

WITH OUTER BEARING.

Specially made by G. W. & Co. to supersede the old style of driving by counter-shaft.

Phœnix Engineering Works, Holland Street, Southwark, S.E.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS,
&c., &c.,
SCOTSWOOD FIRE-BRICK WORKS,
SCOTSWOOD-ON-TYNE.

HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,524 cubic feet per ton of 14½-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

THE TYNE COAL COMPANY, LIMITED, OWNERS,
W. RICHARDSON, Fitter,
29, QUAYSIDE, NEWCASTLE-ON-TYNE.

J. T. B. PORTER & CO.,
GAS ENGINEERS & MANUFACTURERS,
IRONFOUNDERS AND CONTRACTORS,
GOWTS BRIDGE WORKS,
LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.
REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

STANDARD WASHER AND SCRUBBER.

The advantages of the Apparatus will doubtless be understood by those interested in gas manufacture.

The principal points of any Apparatus for the extraction of ammonia may be summarily stated as follows:—

1. **A large amount of Surface is desirable.**
2. **Such Surface should be always effectually Wetted.**
3. **The Surfaces or Scrubbing Material should cause no Pressure.**
4. **The Gas should meet various strength Liquors on its course.**
5. **However small the quantity of Water used, it ought to operate over the whole Surface.**
6. **Changing Scrubbing Material is both Objectionable and Expensive.**
7. **Economy both as to Space occupied and Cost of Apparatus is an important item.**

All these requisitions are supplied by the above Apparatus, of which the following is an explanation:—

A is a cast-iron tank, formed into several separate water-tight compartments.

B B B volutes of sheet iron fitted to the centre shaft, which is driven by the pulley, C, and causing the said volutes to revolve each in a separate compartment filled with water or other fluid.

D, the cover, has partitions fitted into it corresponding with those in the tank, sufficient space being left between the top of the partition in the tank and the lower edge of that in the cover, to allow the gas a free passage through the first volute to the second, and so on to the third, fourth, &c.

The action is as follows:—The crude gas entering at E is partly washed in the first compartment, which becomes 10 or 12 oz. liquor, or stronger if required, according to the quantity allowed to enter per ton; the gas then passes to the second, where the liquor is of a less strength; thence into a weaker liquor, as it passes from one compartment to the other, finishing at the last compartment or outlet, F, with clean water, which is constantly flowing and running over from one compartment to another, until it reaches the last space, from which it flows from the outlet-pipe into the well or tank ready for sale or removal.

Taps are inserted in each compartment for the convenience of drawing liquor for testing, &c.

Applications as to Cost, &c., may be obtained of either

Mr. D. HULETT, 55 & 56, HIGH HOLBORN;
Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER;
Or Messrs. CHANDLER, 104, NEWINGTON CAUSEWAY.

Inquirers will please state their Maximum Day Make.

WARNER AND COWAN'S
SELF-REGULATING GAS-METER.

(THE ONLY METER SUITABLE FOR TROPICAL CLIMATES.)

NOTICE.

The Patent Meter, now generally known as "Warner and Cowan's," had the name of "Self-Regulating" given to it, upon its introduction to the public, to distinguish it from the compensating type, which has been, with more or less pertinacity, pressed again and again upon the purchasers of Meters for upwards of fifty years.

Our firm has given much attention to this description of Meter; the one patented by the late Mr. Esson, of Cheltenham, and manufactured by us, being generally admitted to be the best form which the compensating principle can assume; and thousands of these Meters are at present in use. The combination of this principle with the Warner and Cowan was included in the specification of the latter, and may be had from us, and for exceptionally warm climates would be useful. But we have almost ceased to make the Compensating Meter, having in the "Warner and Cowan" attained the object we strove for during many years—an ABSOLUTE MEASURE of UNVARYING CAPACITY.

Meters constructed upon this principle NEED NO "COMPENSATION," being in this respect the same as every other measure of UNVARYING CAPACITY.

There can be no compensation in a Meter without complication—complication either of machinery to elevate water from a reservoir to the wheel, or the addition of a fountain to maintain the water-level, or of a float for the same purpose; for this is what is meant by a "Compensating" Meter.

None of these contrivances are required in the Warner and Cowan Meter; its measurement is as accurate at a low as at a high water-line, and through all the changes of the same; and, for this reason, neglect of, or imperfect attention to, "SYSTEMATIC WATERING" can never affect the interests of the sellers of gas, the only necessity for it being to keep open the valve for the supply of gas to the consumer, who thus has the chief interest in the operation, and views it without distrust, knowing that the Warner and Cowan Meter is the ONLY one that will not vary with the water-line.

W. & B. COWAN,
WET & DRY GAS-METER MANUFACTURERS,

(ESTABLISHED 1827,)

CHURCH STREET,
MILLBANK STREET,
LONDON, S.W.

FENNEL STREET,
MANCHESTER.

BUCCLEUCH ST. WORKS,
EDINBURGH.

C. & W. WALKER,
8, Finsbury Circus,
London, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, the number in use exceeds **one hundred,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re-quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. and W. Walker, 8, Finsbury Circus, London, E.C., or to Mr. William Mann, late Superintendent of the Chartered Gas-Works, Blackfriars, London; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

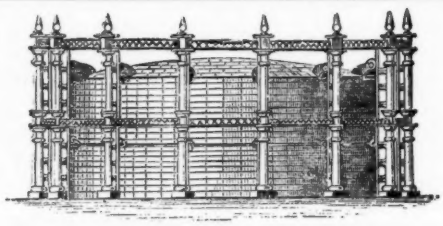
MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

HOPE IRON WORKS,



STOCKTON ON TEES.

ASHMORE & WHILE,

GAS ENGINEERS & CONTRACTORS,

MANUFACTURERS OF GASHOLDERS,

GAS APPARATUS OF EVERY DESCRIPTION,

Including Improved

Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,

And GENERAL IRONWORK.

N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

LESMAHAGOW CANNEL COAL.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

SOLE AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL.

Quotation and Analysis forwarded on application.

G. J. EVESON,

GAS COAL AND CANNEL FACTOR,

Has on offer, in quantities to suit purchasers, Best Wigan Arley Mine, Orrell Screened and Unscreened Gas Coal and Nuts; Best Yorkshire, Real Old Silkstone, Derbyshire, and North Staffordshire Screened and Unscreened Gas Coal and Nuts; also Best Lancashire, Yorkshire, Derbyshire, and other Cannel, as supplied to some of the principal Gas Companies in England, to whom references are permitted.

Analysis and Prices forwarded on application to

HEAD OFFICES, STOURBRIDGE.

N.B.—Gas Managers will oblige by advising when they will be prepared to receive Tenders.

STOURBRIDGE FIRE-BRICKS, RETORTS, CLAY, &c.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

173, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

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The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

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In use at the chief gas-works, and giving great satisfaction.

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GAS COAL

Of superior quality, delivered in trucks at any Railway Station in England, or shipped on board at Hull, Grimsby Docks, or Barrow-in-Furness.

Purified gas per ton of coal in cubic feet (average)	10,262
Illuminating power in candles	15·86
Weight of coke in lbs. per ton of coal	1,502

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THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
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JAMES PATERSON, Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

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(COLLIERIES—PRESCOT, NEAR LIVERPOOL)

Are now prepared to supply their

RUSHY PARK GAS COAL,

Either to Gas-Works in England or Wales, or for Shipment, at Runcorn, Garston, Birkenhead, or Liverpool.

This Coal is of superior quality, and yields in practical working over 10,000 cubic feet of Purified Gas per ton, with an Illuminating Power of 17½ candles.

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AND

LANCASHIRE AND MIDLAND CANNEL.

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Having made arrangements with four large Collieries for the exclusive sale of their GAS COAL and CANNEL, can offer to Gas Companies large quantities, for delivery over one or two years, at exceedingly low prices. His REAL OLD SILKSTONE GAS COAL will give, in regular work, 10,200 feet 16·6 candle gas and 13 cwt. superior coke; and a WIGAN CANNEL 11,375 feet 21·75 candle gas and 12 cwt. superior coke.

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1862.

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This Paint having been in general use over fifteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

The following Gas Companies in London have used the Paint for years—viz., The Gaslight and Coke, Imperial, Independent, City of London, Commercial, London, and Surrey Consumers.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

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CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

Warrington Gaslight and Coke Company,
Offices, Mersey Street, Warrington, April 23, 1877.

Messrs. NEWTON, CHAMBERS, AND CO.,

Gentlemen,

After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

The average of Nine samples gives a yield of 12,500 cubic feet of 15½ Candle Gas, being equivalent to 664 lbs. of sperm per ton, and 1420 lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

Yours truly,

JAMES PATERSON.

Full particulars will be sent on application to us—address as above.

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THE "RELIANCE,"

MANUFACTURED BY THE

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The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

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IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

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